PUBLIC WORKS

Sept.
1954

Claude R. McMillan, Chief Commissioner of the South Carolina Highway Department, administers engineering, construction, maintenance and law enforcement functions of that Department. ***More about him on page 78.***

DO MORE at LESS COST

—with the GALION 503 GRADER

HYD. SHIFTABLE MOLDBOARD

Economy and versatility are important features of this GALION "handy man" Motor Grader. With its many-use attachments it is easily the busiest piece of equipment in highway and street departments all over the country. The GALION 503 does most operations with "big grader" efficiency at less than half the cost. Write for literature.

STANDARD FEATURES

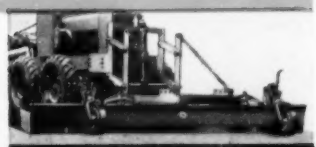
- Positive, 4-wheel tandem drive.
- Hydraulic controls.
- High-clearance front axle.
- Gasoline engine — 50 h.p.
- Four forward speeds, 2.3 to 20.4 m.p.h.; reverse 3.38 m.p.h.
- Front tires 6.00-20, rear tires 7.50-20; larger sizes available.

"EXTRA" FEATURES

- Attachments as illustrated.

ALSO

- Hydraulic circle reverse.
- Leaning front wheels.
- Stand-up height steel cab with full-view safety glass.
- Front-positioned hydraulic scarifier.
- Diesel engine available.



WINDROW ELIMINATOR

REAR END LOADER

BULLDOZER

"V" SNOW PLOW

ESTABLISHED GALION 1907

MOTOR GRADERS · ROLLERS

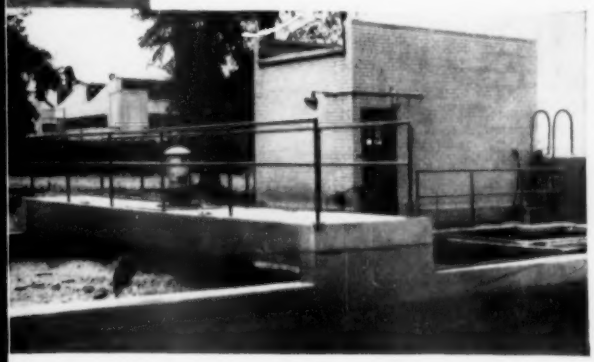
TRENCH ROLLERS · PORTABLE ROLLERS · 3-WHEEL ROLLERS · TANDEM ROLLERS · MOTOR GRADERS

THE GALION IRON WORKS & MFG. CO., General and Export Offices, Galion, Ohio, U.S.A.
Cable address: GALIONIRON, Galion, Ohio

FOR SMALL COMMUNITIES . . .

OST Acres, Harris County Water Control and Improvement District 20, Texas. Frank L. Metyko, Consulting Engineer, Houston, Texas. This plant has won a Texas State Dept. of Health award for the quality of its effluent.

Activated Sludge
'PAKAGE' PLANTS



FOR INDUSTRIES, AIRPORTS AND SUPERHIGHWAYS . . .

Activated Sludge 'Pakage' Plant installed for the Goodyear Tire & Rubber Company Plant, Topeka, Kansas. This 18' unit is designed to treat 125,000 gallons per day. J. G. Turnbull, Consulting Engineer.

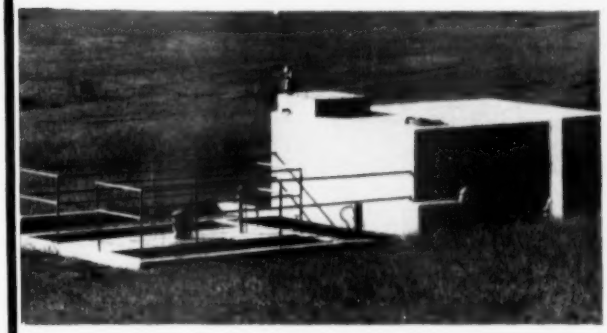
PERFORMING DEPENDABLY IN MORE THAN 230 INSTALLATIONS

Activated Sludge 'Pakage' Plants have a proven 19 year record for producing sparkling clear effluent.

Aeration and clarification are accomplished in a single tank with positive sludge control that covers a wide range of sewage flows and strengths.

'Pakage' Plants handle sewage flows of from 1500 to 500,000 gallons per day in single or multiple units, and may be safely located near dwellings, as the clear effluent produced is free of flies, foul odors and unsightly appearances.

Many semi-automatic features simplify operation and assure trouble-free performance under all conditions. 'Pakage' Plants can be operated by men with State Board of Health minimum classification.



FOR SCHOOLS, HOSPITALS, AND OTHER INSTITUTIONS . . .

Activated Sludge 'Pakage' Plant at Contra Costa, Jr. College, Contra Costa, California. This 7' unit is designed to treat 15,000 gallons per day. Roy E. Ramseier, Consulting Engineer.

Complete Data

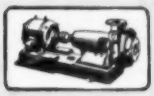
including operating performance charts, specifications, etc., is available upon request.

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

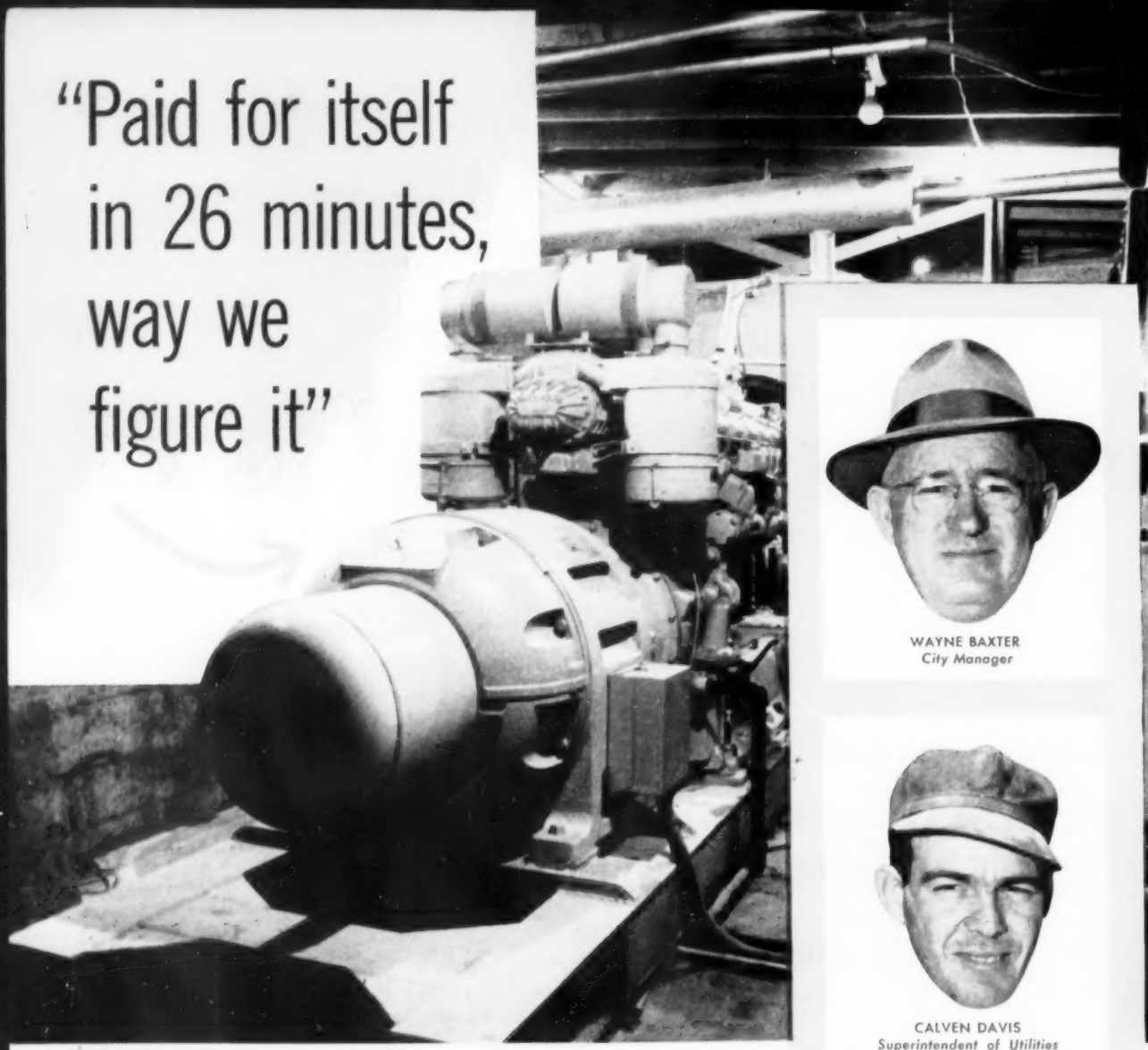
622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clog Water Seal Pumping Units, Samplers.



Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

"Paid for itself in 26 minutes, way we figure it"



WAYNE BAXTER
City Manager

CALVEN DAVIS
Superintendent of Utilities

Back in 1951, the city of Larned, Kansas, installed a Cat® D397 Electric Set as part of its light plant. It was put in primarily to power a boiler feed pump, a circulating pump, and a condensate pump—and secondarily, to serve as emergency standby for the light and water systems in the event of regular power failure.

Says City Manager Wayne Baxter: "We put our D397 in a weatherproof building separate from the main plant. Even if the main plant should be cycloned, our standby source is safe. We've only had to use the D397 in one emergency so far—for 26 minutes—but we figure it about paid for itself in that time."

A lot of other city and town governments are choosing reliable Caterpillar Electric Sets and Engines for similar use as both regular and standby power. They're ready to step in when you need them in emergency or they'll provide steady power for tens of thousands of hours with a minimum of maintenance. They operate with maximum efficiency on low-cost No. 2 furnace oil, for lower fuel bills. Simply designed, easy to operate, there's a Caterpillar unit tailored to your needs—12 sizes up to 315 KW and 500 HP. Your nearby Caterpillar Dealer will be glad to help you find the one that's just right for your town. Why not call him today?

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR®

CUT COSTS WITH CAT POWER

Public Works T. M. Reg. U.S. Pat. Off.

Established 1896

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PUBLIC WORKS MAGAZINE

CONTENTS

September 1954 **Vol. 85, No.9**

THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES

LETTERS from communities —

Sirs:

We have been entirely satisfied with the Model D. It has proved to be a year 'round piece of equipment. We use it in the summer for grading and ditching and in the winter for plowing and it does both jobs well. Maintenance has been very moderate and your service excellent.

L. W. O'CONNOR
Town Manager
Bucksport, Maine

Sirs:

I have operated heavy equipment of all kinds, makes and models for 22 years. I find that with this machine (the Model D) there is no job too large or too small. I clean streets, take dirt off streets, cut a 32-inch ditch for gas, water and sewer lines and backfill, break out asphalt, work base, spread asphalt, maintain all city streets, and build streets for new suburbs. With the rear-end loader I use it for laying 6-inch water lines, clean out sod on city streets, load base material, use it as a dozer blade, and dig and clean out drain ditches at sewer plant.

This machine has finger-tip control and very good visibility . . . it is very easy to do precision work. I highly recommend this machine for high performance and very low maintenance.

CURTIS M. SOLLOCK
Superintendent of Streets, Water Works, Gas & Sewage of the City of Devine, Texas

Sirs:

I have used our D Motor Grader two years. In that length of time I have found it to be very economical and efficient. We never use over a gallon of gasoline per hour on our hardest work. We have built several blocks of streets, sloped banks, cut ditches, and scarified black-top streets and reshaped them. We are going to reshape and refinish about twelve blocks of streets this year. We will use the D for scarifying and oil mixing. In fact, we don't expect to use any other machine on this job.

This machine is an operator's dream. We use our D and TLD Loader for snow removal. The city is very pleased with this machine's performance and economy. I, as the superintendent of streets, think it can't be beat.

GEORGE D. FRENCH
Superintendent of Streets
City of Lamoni, Iowa

Sirs:

Just a few lines to let you know some facts about the two Model D's Pike County purchased a few years ago. They enabled us to divide our mileage in such a way that each machine could make its route once a week instead of once every two weeks as had been the case in the past. The two Model D's were given a route of 30 miles each which they make in 4½ days. As a result we were able to maintain every road we have in the County once a week, therefore, all roads are kept in better condition.

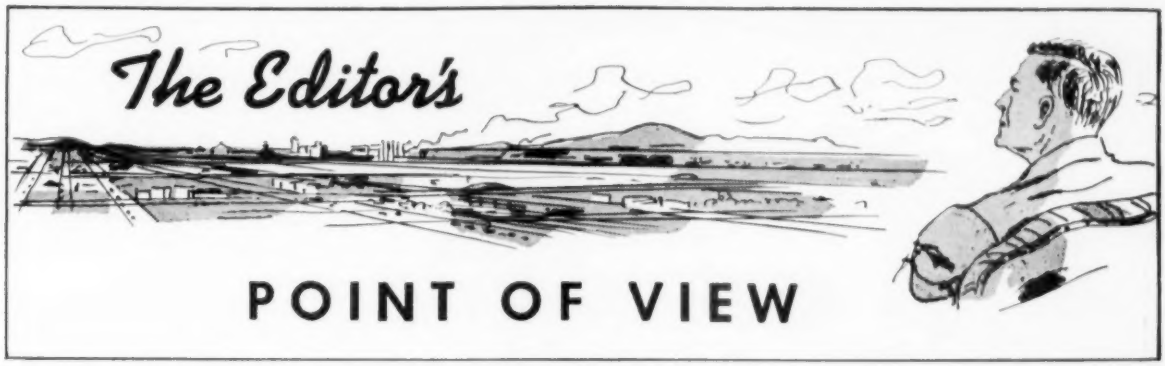
I am firmly convinced that Pike County has profited by the purchase of these machines as the roads are in better condition due mainly to regular routine maintenance.

DALLAS STRUBINGER
County Superintendent of Highways
Pike County, Pittsfield, Illinois

Sirs:

We find our Model D very economical considering the work it performs. Especially like the ROLL-AWAY moldboard and operating ease. Have done a lot of grading, ditching, and snow removal, and find it very satisfactory for a town our size.

CLYDE WOOD
Road Supervisor
CHESTER R. JOHNSON
Water Supervisor
Holden, Utah



Rio Grande Floods and Municipal Water Supply and Sewerage

THE whopping big floods of June and July along the Rio Grande have been the subject of some sound study and observation by the Texas State Bureau of Sanitary Engineering. The object was to determine what should be done in design, construction and operation to insure the continued production of a safe water supply and the proper disposal of sewage. District Engineer R. H. Weiss has made an interesting and valuable report. It is of interest to compare his observations and recommendations with the articles in our October issue on sewerage and in our May issue on water supply works.

Now A Thousand Fluoridation Installations

TO mark the one thousandth city to fluoridate its water, a celebration and dedication ceremony was held at Osawatomie, Kansas, on August 12. Surely fluoridation has gone a long way, fully justified by the benefits to the young folks of these one thousand cities.

"At Last We're Catching Up"

The slow story of the developing use of mechanical equipment by cities, counties and states is well illustrated by the comment of a man from the Washington State Highway Department: "It used to be that we had to shovel a load on a truck and then shovel it off; contractors had mechanical dump bodies on trucks. Then, when the contractors started using hydraulic hoists, we were equipped to hand-crank the body up for dumping and down after dumping. But now we're as well off for equipment as anybody."

We hope his last sentence is true. There is nothing more important than constructing and maintaining our public works, for these are the things that affect people directly in many essential ways. For many years this magazine has urged the full use of modern cost-saving and labor-saving equipment; it has published many articles showing the advantages of utilizing such equipment; every month it has several pages describing new developments in useful equipment. And, because newer and better methods and equipment are constantly being developed, it will continue to do this.

Public works, which cost the public money, but give them essential service in return, should be the first and foremost to utilize the most economical equipment and the best materials.

Data on the Costs of Sewer Construction and Treatment Plant Operation

IN COURSE of preparation by the Editors of this magazine is a large-scale study of the costs of sewer construction and sewage treatment plant operation. It will be some time before the data from more than a thousand cities, large and small, are analyzed and tabulated. Though there are wide variations from the average, it is believed that much information of value will result. For instance, the first 21 cities in California—about half of those reporting—show an average cost per foot for 8-in. sewer of $2.79, with variation from $1.05 to $4.75. The average for 16 cities reporting on 10-inch sewer is $3.39 per ft.; and for 16 cities, the cost for 12-inch sewer is $4.30 per ft. The cost of sewage treatment plant operation was broken down under the heads of operating cost, maintenance and repair and interest and amortization. Fifteen California cities showed overall per capita operating costs of $3.74 for primary treatment plants, $2.49 for trickling filter plants and $2.65 for activated sludge. These figures evidently require further study, though the population range of the cities reporting is fairly good—4500 to 45,000.

Getting Tuned Up for the Fall Football Season

LAST month we devoted considerable space to the problems of getting ready for winter. Here is a little space devoted to getting ready for the fall football season. A lineman intercepts a forward pass on the enemy 40-yard line and runs straight down the field at 15 ft. per second. Slow, but it is late in the game and he is tired. The only nearby opponent is 20 yards to one side, also on the 40-yd. line. The would-be tackler runs at a rate of 18 ft. per second, always directly at the ball carrier. Does he catch the ball carrier before he reaches the goal line?

A reliable material

Installing 30-inch cast iron mechanical joint pipe for outfall sewer at East Providence, R. I.

Where installations are planned for long-term service to assure low cost per service year, engineers rely on cast iron pipe as a dependable and adaptable material. Consequently, it is specified for a wide variety of applications, both utility and industrial, including water supply, gas, sewerage, fire protection, power plants, oil refineries, process industries and many forms of special construction. Long life and low maintenance cost are *proved* results of the high beam-strength, compressive-strength, shock-strength and effective resistance to corrosion of cast iron pipe. For information write: Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Ave., Chicago 3, Ill.

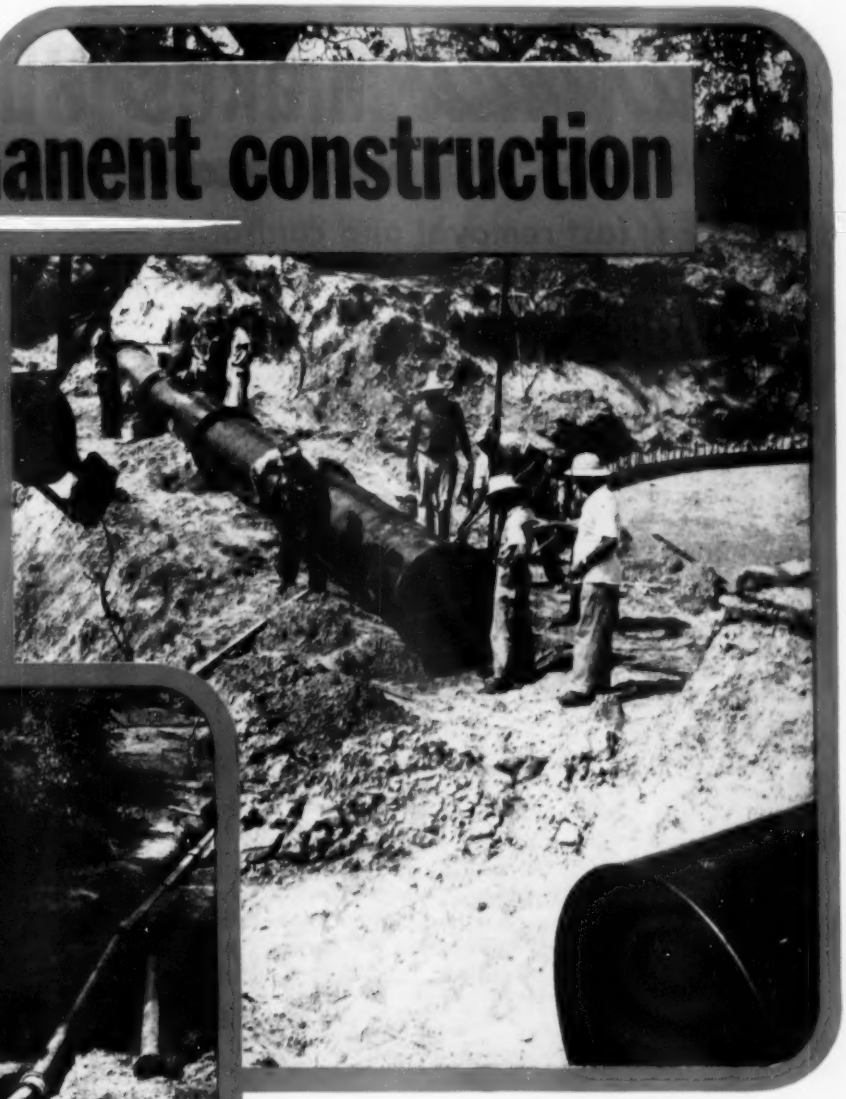
(above)
Laying 16-inch cast iron pipe alongside railroad tracks at Ft. Lauderdale, Florida.

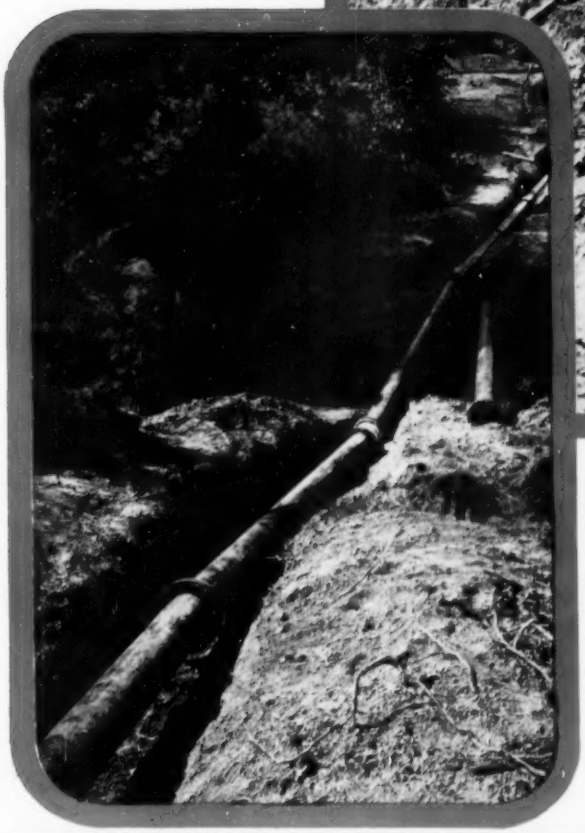
(at right)
Cast iron pipe being installed for large process industry plant in Chicago.

CAST IRON PIPE

Get full details of this month's products . . . mail your Readers' Service card today.

for permanent construction





(above)
Installing 30-inch cast iron pipe for sewage treatment plant at Panama City, Florida.

(at left)
Eight-inch mechanical joint cast iron pipe installed under difficult conditions to carry coal mine water at Sumiton, Ala.

SERVES FOR CENTURIES...

..for the Battle of Ice and Snow!

SPREADERS for ICE and SLEET CONTROL

The Jet Line of spreaders for salt, sand, cinders and calcium chloride is designed for fast action, maneuverability and wide coverage, important to fast control of icing conditions. Also widely used for seal-coating and aggregate spreading.

FIVE STANDARD MODELS, *in various sizes:*

JET ACE—Gasoline Motor Driven, Twin Spinner, Electric Cab Controls.

JET KING—Gasoline Motor Driven, Twin Spinner, Cable Cab Controls.

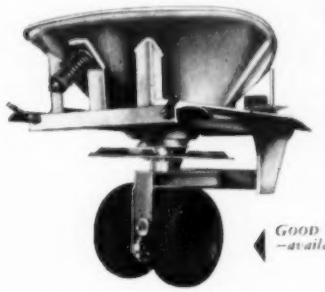
JET QUEEN—Gasoline Motor Driven, Single Spinner, Cable Cab Controls.

JET JACK—Power Take-Off Driven, Single Spinner, Cable Cab Controls.

JET HYDRAULIC—Full Hydraulic operation on conveyor and spinners, cab controlled, powered from power take-off through Hydraulic pump.

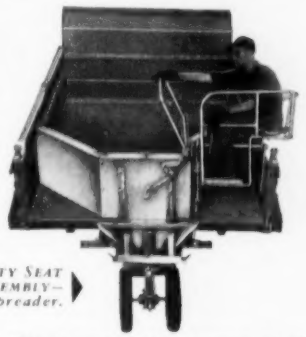
Adjustments can be made on all Jet Spreaders for various applications and materials to produce the desired width and thickness of spread. Types are available for special applications, for mounting on dump bodies, stake bodies, or special truck chassis.

4-U TOWED SPREADERS



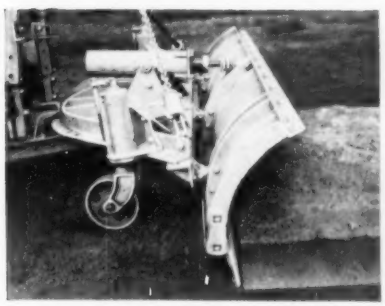
GOOD ROADS 4-U SPREADER —available in 5 wheel sizes.

The popular low-cost 4-U spreader illustrated at left can fit any truck dump body and attaches in only fifteen seconds. It is made in five wheel and tire sizes for various spreading ranges. Spread is adjustable up to 270° with variable width control. Available for use with 4-U spreader is the patented GOOD ROADS SAFETY SEAT AND TAILGATE ASSEMBLY shown on the right.



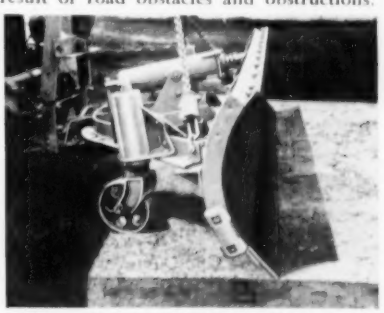
GOOD ROADS SAFETY SEAT and TAILGATE ASSEMBLY— in use with 4-U Spreader.

GOOD ROADS SAFETY BLADE TRIP— Good Roads Automatic Safety Blade Trip is an exclusive feature of all Good Roads Reversible Blade and One Way Plows. It enables plows to operate at higher speeds without danger of damage to equipment or injury to the operator as a result of road obstacles and obstructions.



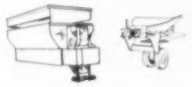
Plow strikes 8" obstruction at full speed . . . springs compress in cylinders and top of blade tilts forward to absorb shock.

Blade continues forward and rides upward, carrying plow over obstruction with impact negligible to truck or operator.



Still moving at original speed, blade snaps back to plowing position with no damage to machine or operator and without spilling load.

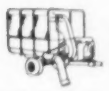
SNOW PLOWS



ICE CONTROL SPREADERS

ESTABLISHED 1878
Good Roads
MACHINERY
CORPORATION

AGGREGATE SPREADER



LEAF COLLECTOR

SCAVENGER

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Builds Land with Buried Waste

El Paso, Texas, uses Sanitary Landfill Method of Refuse Disposal to Create Valuable Industrial Sites

The city of El Paso, Texas, has an easy, efficient way to get rid of refuse and saves money over the old way in the process.

El Paso, like many other progressive American communities, uses the Drott-Bullclam Shovel Method of Sanitary Fill for garbage disposal. More than 2200 cubic yards of garbage and other waste is deposited daily on the fillsite by 30 city-owned collection trucks, 34 commercial refuse haulers and 308 private concerns. Dumped on what was part of the old open dump, refuse is spread, compacted and covered by either of the city's two INTERNATIONAL TD-18A crawler tractors equipped with Drott-Bullclam shovels.

With the steady flow of fill material, the once worthless land is rapidly converted into valuable commercial and industrial sites, sold for sums sufficient to cover all operating expenses.

As Ed F. Muckelrey, Superintendent of Sanitation for the city of El Paso says, "*We're building needed land and beating the common fly and rat problem at the same time.*

"*It was a tough job putting the old dump in shape. We started by covering each day's accumulation with old ashes. Now we use topsoil. And we have no trouble selling the clean, completed portion of the fill to meet our costs. One of the last parcels sold for $25,000.*

"*I can't praise the machines enough that made this landfill possible.*"

Only INTERNATIONAL crawler tractors with matched Drott-Bullclam shovels are specifically designed for the Sanitary Landfill Method of refuse disposal.

To select the site, train the operator and put the most efficient unit on the job, call your INTERNATIONAL Industrial Distributor today.

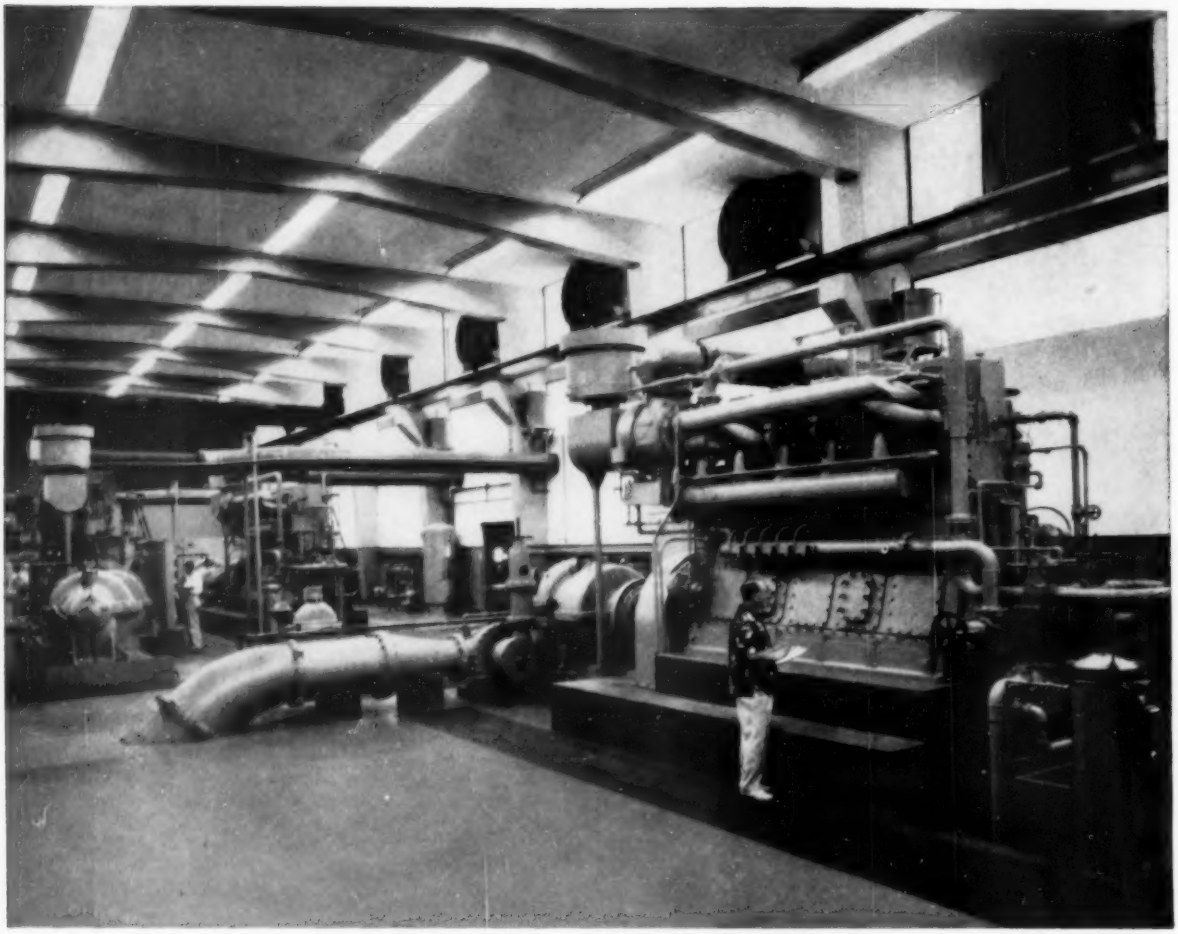
Or write:

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

DROTT MANUFACTURING COMPANY, MILWAUKEE 8, WISCONSIN

Thousands use our Readers' Service card to keep up to date . . . do you?

ONE OF THE TWO INTERNATIONAL TD-18A crawler tractors with Drott-Bullclam shovels owned by the city of El Paso compacts and covers the refuse deposited daily on the community's Sanitary Landfill site. Visible in the distance is a radio tower and transmitter, erected on land "built" by the Sanitary Landfill Method.



HURRICANE-PROOF WORTHINGTON DIESELS furnish power for Miami's pumps (they're Worthingtons, too) in the new Southwest System pumping plant.

Four Worthington Diesels guard Miami's water supply

This year folks in Miami, Florida, will be sure of enough water for fire protection, sanitary service, and all their other needs, even if hurricanes strike.

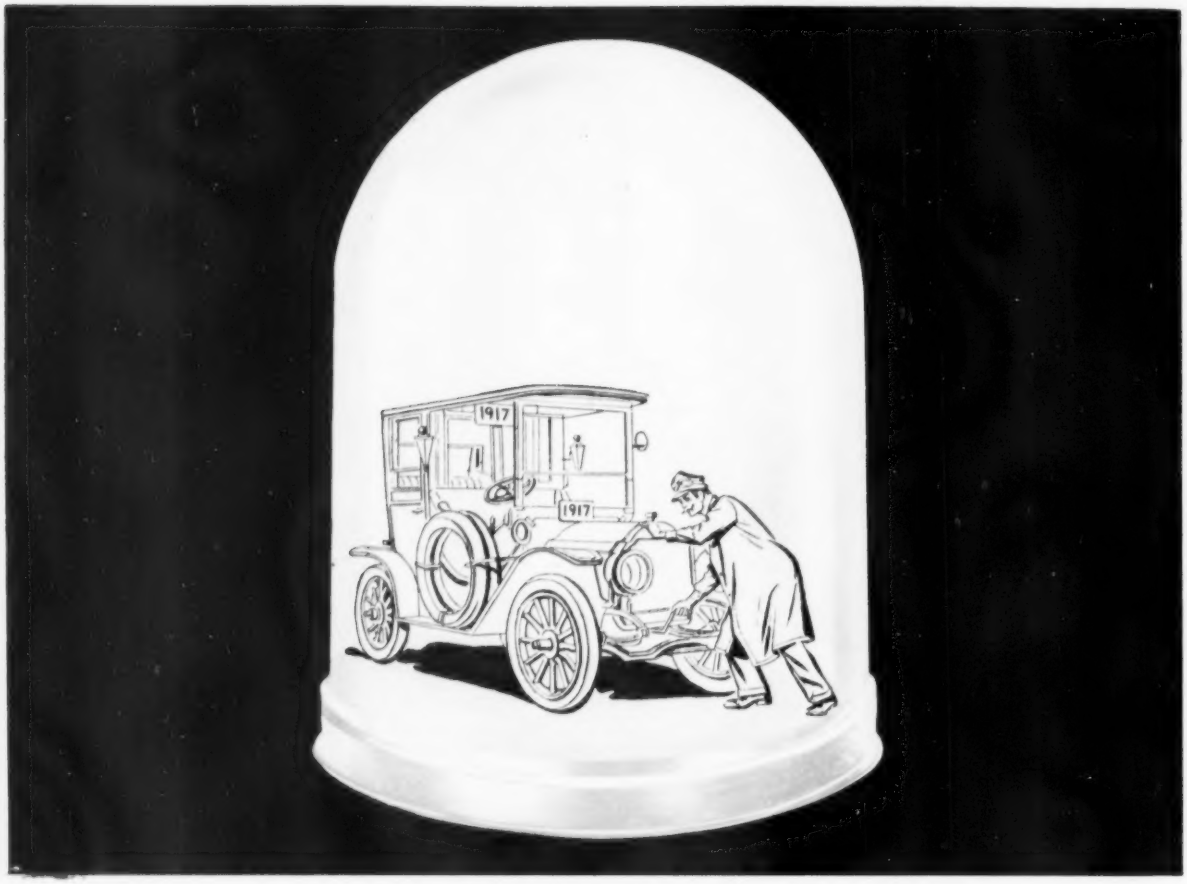
It'll be pouring from the city's new Worthington Diesel-powered pumping station at the rate of 40 mgd by the end of 1954, thanks to four supercharged 825-hp Worthington Diesel engines which furnish power for the station.

So if *you're* looking for dependable power, be sure to check the Worthington line of Diesels. And get the facts on *all* Worthington public works equipment — centrifugal pumps, vertical turbine pumps, and sewage disposal equipment. Write Worthington Corporation, Public Works Division, Section E.4.9, Harrison, N.J. E.4.9

WORTHINGTON

Economical, Continuous Power — Diesels, Dual-Fuel and Spark-Ignition Engines, from 200 to 5,000 bhp.

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.



how much does it cost... to "crank" an old chlorinator?

The automobile self-type starter isn't news any more—nobody ever cranks a car these days. "Cranking" an old-style chlorinator is equally out-dated.

The F&P mechanical, instrument-type chlorinator is sweeping the country, sales mount month by month. Why? Because municipality after municipality, consulting engineer after consulting engineer, reports the same facts: F&P chlorinators are lower in first cost, are easier to handle, because they are so simple in design, so light in weight, so modern in construction. More important, however, it is always stressed that F&P chlorinators require practically no maintenance, practically no spare parts.

We claim that if you are operating a chlorinator that has a bell jar on it *you need a new chlorinator.* You are "cranking" an old, costly, inefficient chlorinator. Everybody knows that dry chlorine is not corrosive—but that as soon as you put the chlorine in contact with water or water vapor it becomes corrosive. That's what the water tray types of chlorinators do: put dry, non-corrosive chlorine in contact with water and make corrosive vapor out of it. It's not engineering sense and the way to avoid it—and the resulting expensive maintenance—is to get F&P *mechanical, instrument type* chlorinators.

Don't refrain from writing us because you don't need additional chlorinating capacity right now. Moreover—if it is time for a major overhaul or a rebuilding of your bell jar chlorinator, let us quote you for doing this work. We will give you what you may not have gotten previously—a firm price for doing the job before we start on it. The price will be a reasonable one, but we'll also quote you a price for replacing the chlorinator and if you want to spread the cost of the new one by time payments or if you want a lease arrangement, you can have it. Chances are you cannot justify further overhaul or further rebuilding—even at our *fair* price for doing the work.

complete process instrumentation

FISCHER & PORTER CO.

394 Fischer Road, Hatboro, Penna.

18 YRS. EXPERIENCE SUCCESSFULLY MANUFACTURING CHLORINE FLOW METERING EQUIPMENT

LA 1010

48 miles of CONCRETE PIPE assure adequate water supply for Savannah River Project

Producing materials for both A and H bombs at the Savannah River Plant in South Carolina requires enormous quantities of water. This water, from the Savannah River, is carried in concrete pipe lines to two pump houses, then distributed by other concrete pipe through the 315 square-mile plant site. From the pump houses the shortest line is 29,834 ft., the longest 62,419 ft. The system required 48 miles of concrete pipe.

Extremely difficult engineering problems were encountered in building this project because of the high water table in the entire area. Complete wellpoint systems had to be installed on every line as shown in the photograph. Many lines were laid in swamps and under creeks and railroads.

Whether the water line you plan is to be long or short, concrete pipe offers you the rugged strength, the long life and the economy necessary for satisfactory service. Its tight joints and dense structure prevent leakage and infiltration.

Because durable concrete pipe is not subject to damaging internal corrosion, it will maintain constant hydraulic efficiency. And it delivers long years of dependable, ***low-annual-cost*** service.

CONCRETE PIPE USED IN SAVANNAH RIVER PROJECT			
48"	410 ft.	66"	65,225 ft.
54"	5,250 ft.	72"	23,178 ft.
60"	28,493 ft.	78"	30,472 ft.
		84"	100,529 ft.

PORTLAND CEMENT ASSOCIATION

33 WEST GRAND AVENUE, CHICAGO 10, ILLINOIS

A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work

Thousands use our Readers' Service card to keep up to date . . . do you?

Something has been done about

This new revolutionary method for handling huge quantities of rubbish on long hauls offers tremendous savings.

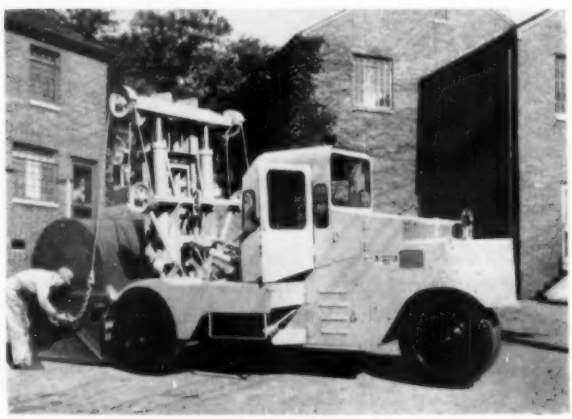
With this announcement we introduce the new Dempster-Dumpster GRD 304, designed to handle large Dempster-Dumpster Containers in combination with a big capacity trailer. It may be the solution to your problem of handling trash and rubbish over the long haul from points of accumulation to the dump. Here is how it works:

1. You replace inadequate, unsanitary and costly conventional trash cans, barrels, etc. in heavy rubbish production districts such as housing areas with big Dempster-Dumpster Detachable Containers. These containers range up to several times the capacity of the average dump truck body. (In one large housing area 18 Dempster-Dumpster Containers are now doing the job that formerly required 440 conventional cans.) Containers have self-latching doors opened by the tenants for depositing refuse, then close, sealing up the trash . . . eliminating unsanitary conditions, fire hazards, rats and scattered trash by winds and scavengers.

2. On schedule, this fast-moving new Dempster-Dumpster and a 40 to 50 cu. yd. trailer truck, with or without compaction, serve the containers. With its hydraulic tricycle steering, finger-tip control and short overall length, this Dempster-Dumpster features quick and easy maneuverability in handling the big containers, one after another. Only two men—the Dempster-Dumpster operator and the trailer-truck driver—are required for the entire operation. The Dempster-Dumpster picks up each container, moves it to trailer and dumps the waste materials. The trash and rubbish from one to several housing areas can be loaded into one big trailer.

This new system offers a great opportunity for low cost, sanitary rubbish collection. It enables you to eliminate trucks standing idle, eliminate loading crews and costly re-handling of trash and rubbish. Write us for complete information today! Manufactured exclusively by Dempster Brothers, Inc.

The photo at right shows the GRD 304 operator attaching lifting chains to a loaded 8 cu. yd. Apartment Type Container in a large housing area. The container is then hoisted hydraulically to carrying position, as shown above. Note the trailer near-by in background. The load is then placed in high position for dumping rubbish in trailer as shown in large photo at right. Several containers will be serviced in this same manner before trailer proceeds to another convenient loading point.



DEMPSTER DUMPSTER SYSTEM

DEMPSTER BROTHERS

Get full details of this month's products . . . mail your Readers' Service card today.

the Long Hauls of Trash and Rubbish

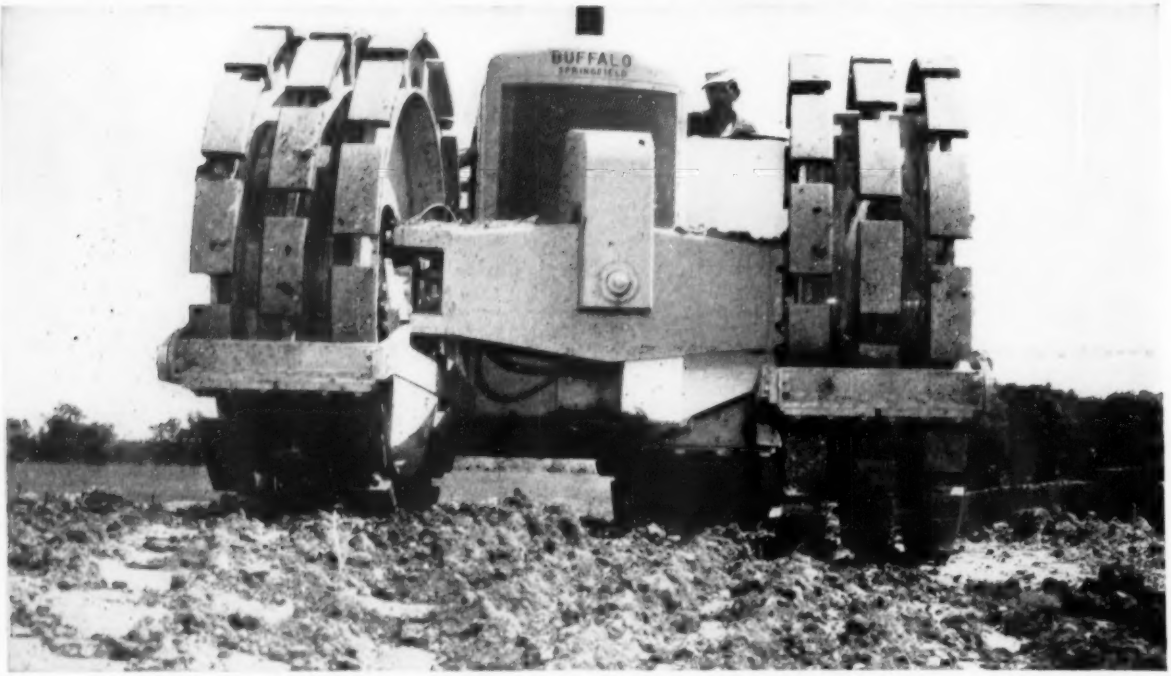
● Meet Us At The Shows

American Public Works Congress, Atlantic City, September 19-22. Booths 32-33-34, Municipal Auditorium. Hotel Claridge Headquarters Suite 608-9. NAHO Conference in Philadelphia October 11-14.

994 DEMPSTER BUILDING, KNOXVILLE 17, TENNESSEE

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

You've never before seen Compaction like this!



Announcing the new and revolutionary

Buffalo-Springfield Kompactor

What do we mean by "new"? There's *never* been anything like it before!

Why do we say "revolutionary"? Because the Kompactor is changing *drastically* the time and cost elements in soil compaction jobs!

Here are the spectacular results of tests in the field:

> ***The Kompactor has met density requirements in one fourth the number of passes required with large sheepsfoot, vibrating, or heavy pneumatic-tired rollers. One contractor reports a cost savings of 50% on an embankment job!***

The Kompactor is self-propelled, reversible, and easy to maneuver on steep embankments, can work in close to abutments, culverts, etc.

The unique rolls of the Kompactor are *segmented*. The staggered "islands" that form the rolling surface enter loose material with minimum displacement, either forward or horizontally. They leave without disturbing compacted areas in any way. All compaction effort is *downward*, resulting in greater and more uniform density from lower elevations to top surface. As a result, *two passes with the Kompactor will often meet density requirements!*

Before you bid another soil compaction job, find out more about the Buffalo-Springfield Kompactor. It may completely change your time and cost picture, give you a clear-cut advantage in bidding those close jobs!

There's a Buffalo-Springfield Distributor conveniently located to serve you.

Write today for full information.

The Buffalo-Springfield Roller Co.
Springfield, Ohio

BUFFALO SPRINGFIELD
THE STANDARD OF COMPARISON
SPRINGFIELD, OHIO

THE LEADER IN ROAD ROLLER DESIGN AND MANUFACTURE.

Now's the time to mail this month's Readers' Service card.

CONTROLLING CURB PARKING SPACE

As a regular reader of your maggazine, I was very interested in the article in the July issue entitled "Let's Control Curb Parking Space".

One problem that I would be most anxious to have Mr. Michael discuss is how he would get public acceptance along the same block of a short time meter and a long time meter having different price levels. For instance, having one meter at a rate of 30 minutes for 5¢ and another meter at a rate of 60 minutes for 5¢.

I mention this because we in Grand Rapids, after a recent study, are now placing 30 minute meters on our streets because we feel public opinion is against a charge of one hour for 10¢ (although this amount is cheaper than parking lot rates) because of "meter feeders".

Jerome D. Franklin
Traffic Engineer
Grand Rapids, Mich.

REPLY BY MR. MICHAEL

The problem of having meters in the same block that have different time limits and different cost rates may not be as much of a problem as one might suspect at first glance. My reasons for saying this are fivefold:

1. The public has indicated a willingness to pay a premium for time-saving convenience — witness the many articles on the present toll road success. The location of the required number of short-term parking spaces near oft-used destinations would be such a convenience for the short-term parker and I feel he would willingly pay the premium for the choice location.

2. As you point out 5¢ for 30 minutes is less than any comparable lot or garage parking.

3. A higher rate and the short-term limit would discourage the "meter-feeders". It, of course, should be illegal to feed any meter

—they were installed to use parking space more efficiently.

4. Since many motorists use a nickel as the smallest change they insert in a meter, the total cost of parking would remain the same, for example 5¢ at a 30-minute meter or at a 60-minute meter. I am convinced motorists do not consider the cost of anything on a time-rate basis but only on a total cost basis.

5. I feel that a good public-education campaign which stressed the value to the motorist of short-term spaces in choice locations would sell him on the premium price for a premium space.

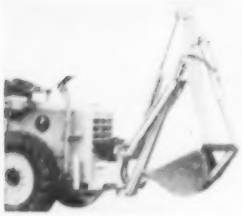
It would also appear to me that in discussing and publicizing the 5¢ 30-minute meters one should talk about the cost in terms of maximum cost per parking space—5¢, not 10¢ per hour. The motorist cannot pay 10¢ at any space because he can stay only 30 minutes so 5¢ is his cost—5¢ per space, the same as the maximum per space at a 60-minute meter. Public opinion may be against a charge of 10¢ per hour but I doubt whether it is against 5¢ per space—regardless of the time limit —when the space is provided where it is required for the parker that needs it.

H. L. Michael,
Asst. Dir., Joint Hwy. Res. Project
Purdue University
Lafayette, Ind.

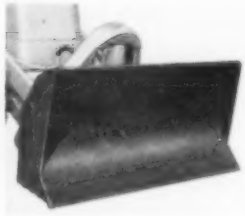
REPORT FROM JACK HINMAN

We left Mayaguez on the SS Monarch of the Seas of the Waterman Line on 26th May and arrived in Mobile on 30th May after a delightful voyage. Our car was unloaded intact the following day and we started to drive north at once. We got to Iowa City June 3rd and after about twelve days we started for California in a new Mercury. We got here on the afternoon of the 22nd. We plan to fly to Hawaii on July 7th. Young Jack's address there is: Commander Jack J. Hinman, III, US Navy, Box 442, NAS, Navy No. 14, c/o Fleet Post Office, San Francisco, Calif. After about two weeks, there, I think we will come back to the Mainland and return here for a short time. If I do not have a new assignment by then, I think we may rent a furnished house or apartment and stay for a bit instead of going straight back to Iowa City. I may actually get at doing some writing. While I was in Mayaguez I spent so much time writing class material that I had no

(*Please turn to page* 183)



Back Hoe makes a "PAYLOADER" a double-duty digger.



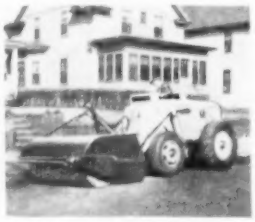
Backfill Blade is available for most "PAYLOADER" sizes.

Rotary Plow has its own engine — loads or throws snow.

Operator Cabs for greater comfort, winter or summer.

Fork Lift has adjustable fork-spacing for many unit loads.

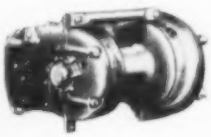
Scarifier loosens tough soil for faster, easier handling.



Pick - up Street Sweeper attaches on bucket — dumps its loads into trucks.

Blade Plows are available — both rigid and reversible, trip blade types.

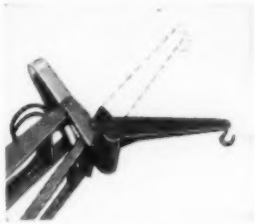
Pusher Plate — a convenient attachment to spot cars.



Winch for rear-end mounting — for hoisting and hard-to-reach pulls.

Land Clearing Blade for digging out boulders, brush, stumps.

4-wheel-drive "PAYLOADER" models, with V plow are proven snow fighters for both country and city highways . . . have power to handle heavy snows . . . maneuverability for fast alley-clearing.



Crane Hook quickly mounted to handle pipe, bars, timbers, etc.

"in season"

PAYLOADER

tractor shovels work for you the whole year through

When you buy a standard "PAYLOADER" you're investing in a machine so versatile that you can use it 12 months of the year — that can dig, grade, spread, pile and load dirt . . . that can handle materials and load snow.

In addition a variety of special buckets, attachments and accessories are available so you can use your "PAYLOADER" for more and special jobs.

For information on the complete, proven "PAYLOADER" line plus ALL the special equipment available, see your Hough Distributor, or write The Frank G. Hough Co.

Standard buckets can be used to load dirt or snow, but special larger buckets are also available for snow-handling.

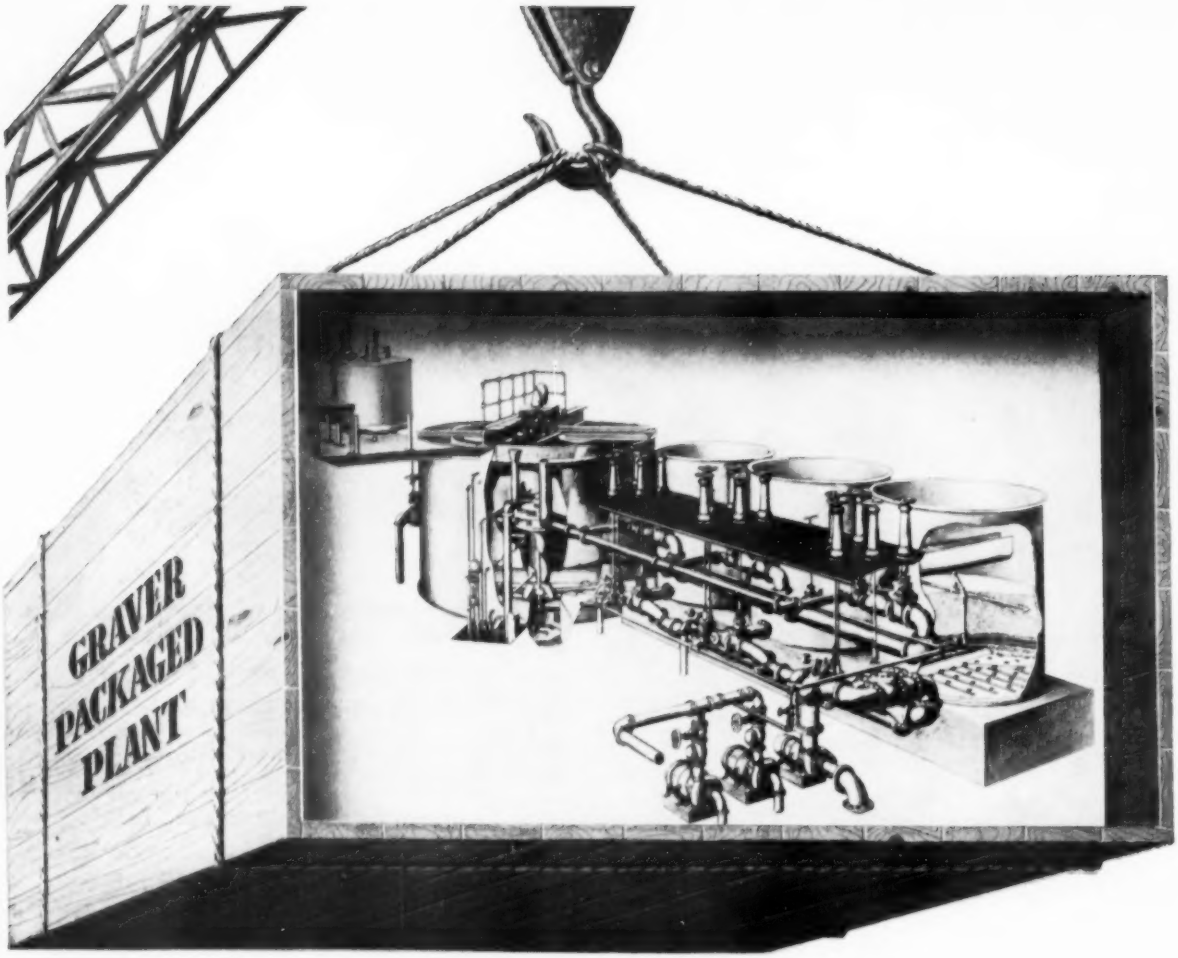
THE FRANK G. HOUGH CO.
761 Sunnyside Avenue • Libertyville, Illinois

Please send me more "PAYLOADER" information.

NAME .....
TITLE .....
COMPANY .....
STREET .....
CITY ..... STATE .....

☐ have distributor call
☐ send information on all seven models
☐ send information on all attachments.

Now's the time to mail this month's Readers' Service card.



This Graver-designed plant treats water for less cost per gallon

You get more for your money with Graver's "packaged" plant for water treatment and filtration because there are these savings:

1. ENGINEERING – Pre-engineered, standard equipment designs in capacities up to 2 M. G. D. . . . custom-made designs for larger capacities . . . functionally integrated to minimize equipment cost, space and costs of chemicals . . . with resultant savings to the customer.

2. PRODUCTION – Responsibility centralized in one dependable equipment supplier for maximum economy in fabrication, assembly and construction.

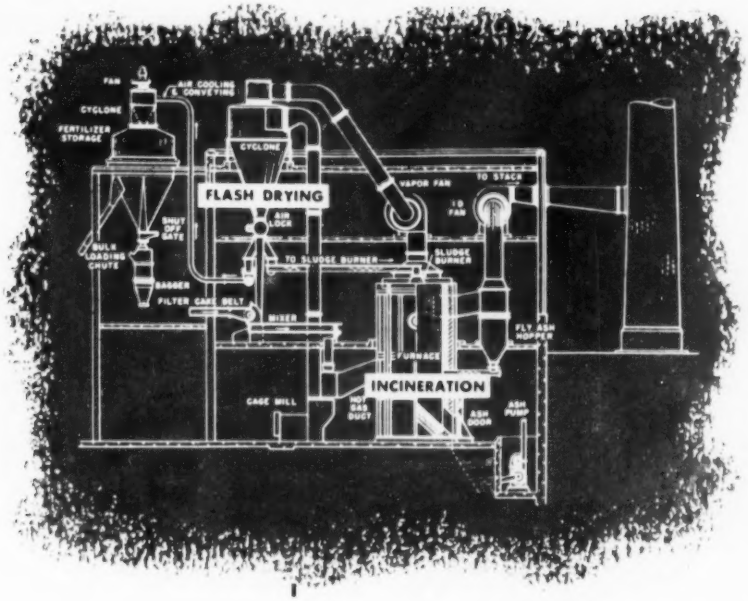
3. OPERATION – Designed with simplified controls and up-to-date materials of construction to minimize necessary operating attention.

A Graver "Packaged" Water Treatment Plant includes (ready for installation): High-rate, solids-contact coagulation and softening Reactivator® of either concrete or steel construction; gravity or pressure filters; clearwell, chlorinator, wet or dry chemical feeders, recarbonator where required, and controls. There is nothing more to buy.

Write for Graver Municipal Bulletin and Sample Layouts.

GRAVER

GRAVER WATER CONDITIONING CO.
A Division of Graver Tank & Mfg. Co., Inc.
216 West 14th Street, New York 11, N.Y.



SOME FACTS ABOUT THE HEAT DISPOSAL of SEWAGE SLUDGE

Even though dried sewage sludge can often be sold at from $5.00 to $20.00 a ton – remember that is not *always* the case.

If sewage is contaminated—with grease, fiber, etc., for example—you may find the *only* thing to do is to incinerate the sludge. On the other hand, even though the sludge may not have the highest chemical analysis for fertilizer – it still can be marketed as a soil conditioner—thereby eliminating the ash disposal problem.

The C-E Raymond System of Flash Drying and Incineration is the most popular . . . most versatile on the market today. That's why you will find a C-E Raymond System to provide one or all of the following processes . . . controllably, accurately, economically:

1. **Flash Dry sludge.**
2. **Flash Dry and Deodorize.**
3. **Flash Dry and Incinerate.**
4. **Flash Dry, Incinerate and Deodorize.**
5. **Incinerate only.**
6. **Incinerate and Deodorize.**
7. **Flash Dry and Deodorize in conjunction with refuse and garbage incineration—plus incineration of sludge if desired.**

C-E Raymond Systems now in service or on order serve an equivalent population of more than 17,000,000 people – in communities ranging from 6,000 to 3,600,000 in population . . . in every section of the country, and even overseas.

Whatever your requirements – there is a C-E Raymond System that will satisfy them precisely. Let one of our engineers show you or your consultants how this leading system of sludge disposal will work for you.

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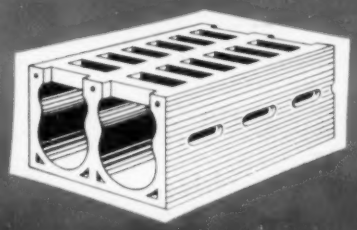
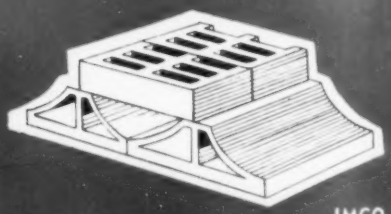
ALSO FLASH DRYING AND INCINERATION SYSTEMS FOR INDUSTRIAL WATER DISPOSAL

Thousands use our Readers' Service card to keep up to date . . . do you?

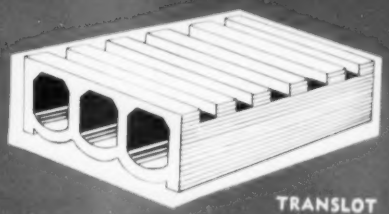


ACCELO HI-CAP
(AMCRE)



IMCO

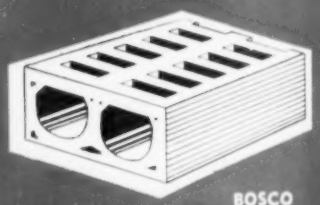
BLOCKS



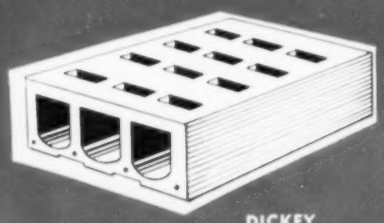
TRANSLOT

Send for the Handbook of Trickling Filter Design—1954

The best trickling filters use *vitrified clay filter bottom blocks.* We have just issued an enlarged and revised edition of this popular handbook. If you don't have one write for your copy today without obligation. Just address any member of the institute and it will be sent free of charge.



BOSCO



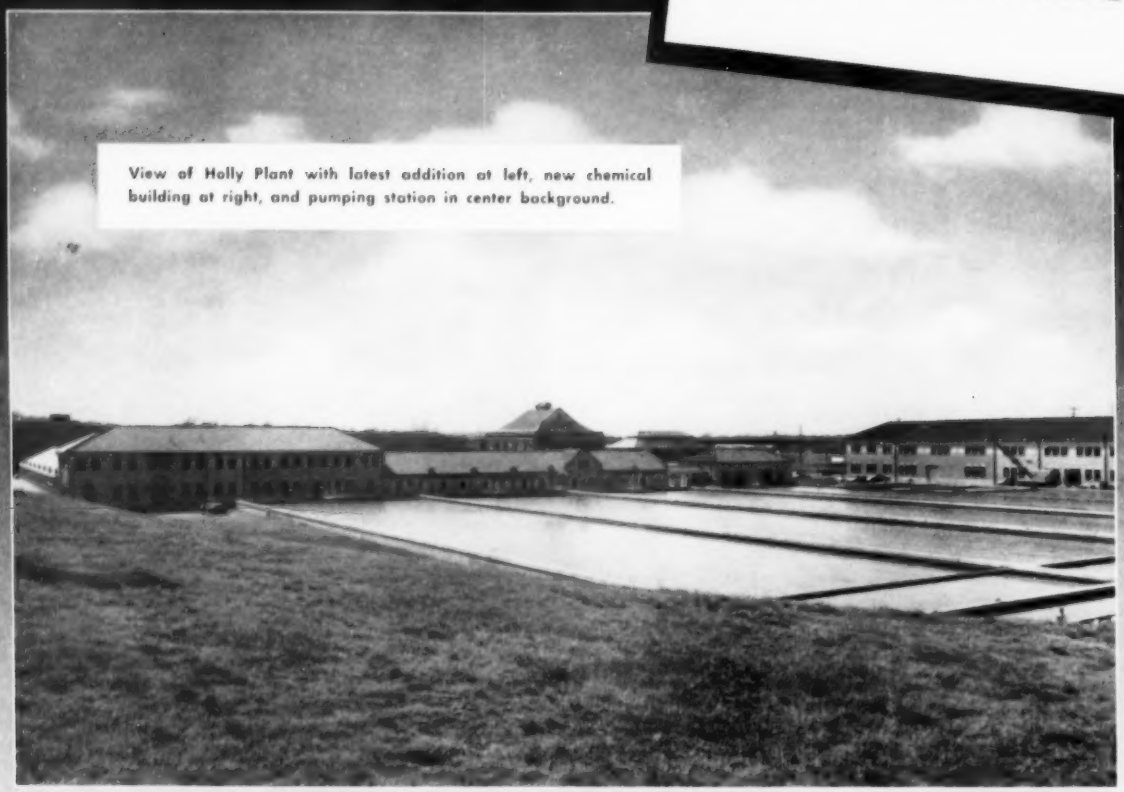
DICKEY

8 176-foot trickling filter units at Dallas, Texas, White Rock sewerage treatment plant, using Tex-Vit translot blocks. Consulting Engineers, Powell & Powell.

*Reg. Trade Mark of Infilco Incorporated

FORT WORTH, TEX.
Holly Water Treatment & Pumping Plant
(EXPANSION COMPLETED IN 1952)

FREESE & NICHOLS
Consulting Engineers
FORT WORTH, TEXAS



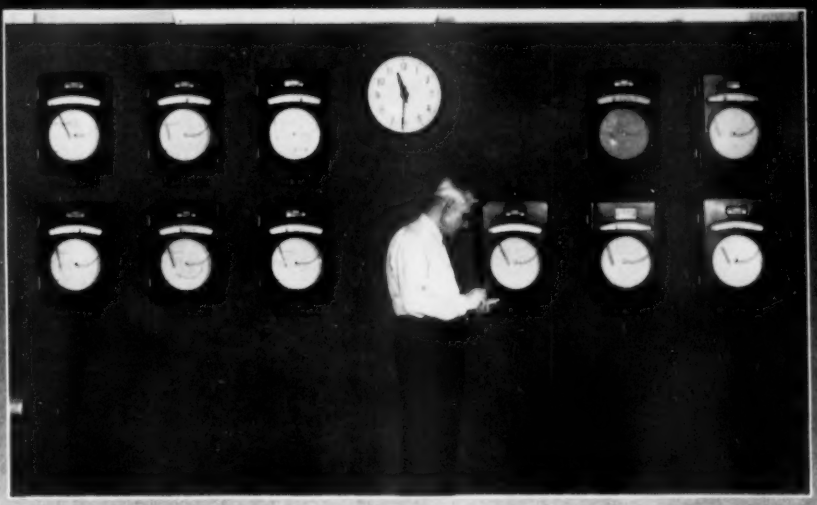
View of Holly Plant with latest addition at left, new chemical building at right, and pumping station in center background.

To keep pace with the dramatic growth of Fort Worth has necessitated almost constant expansion of the city's water supply system. Since World War II, treatment facilitites at the Holly Plant have been increased from 35 MGD to the present total rated capacity of 80 MGD. The Holly Plant, to-day, is the center of a multi-million dollar water supply system on which Fort Worth stakes its future.

This plant is operated by W. S. Mahlie, Supt. and Chief Chemist of Water Purification, under the direction of Uel Stevens, Director of the Water Department. The plant incorporates the latest in control and metering equipment by Builders-Providence, Inc., installed under contracts by Ottinger Construction Company, Glade-Friedman-Byrne, Contractors and E. E. Ericson Company, with the assistance of Morey & Morey, Engineers of Dallas, Texas. With the installation of the Builders Filter Controllers, Gauges, Filter Operating Tables, Wash Water Controller, and Chronoflo Transmitters and Receivers, Fort Worth continues a long-standing tradition. Builders equipment has served at Fort Worth since the early 1900's when the original Holly Pumping Station was built. For detailed information on Builders Water Works Equipment, address **BUILDERS-PROVIDENCE, INC., Providence, Rhode Island.**

The new filter gallery showing 16 Builders Filter Operating Tables with Loss of Head and Rate of Flow Gauges, Valve Operating Levers, and Valve Position Indicators . . . for convenient control of each Filter.

Supt. W. S. Mahlie taking readings at the main operating panel in the Holly Plant Filter Building. Panel instruments are Builders Chronoflo Receivers for centralized flow, level, and summated flow metering. Operation is by simple two-wire electrical circuits.



Eight Omega Model UF-2 Universal Volumetric Feeders for feeding hydrated lime and alum. Each feeder is equipped with an extension hopper to confine chemical storage and hopper filling to the floor above.

BUILDERS-PROVIDENCE

DIVISION OF B-I-F INDUSTRIES, INC.

BUILDERS IRON FOUNDRY • PROPORTIONEERS, INC. • OMEGA MACHINE CO.

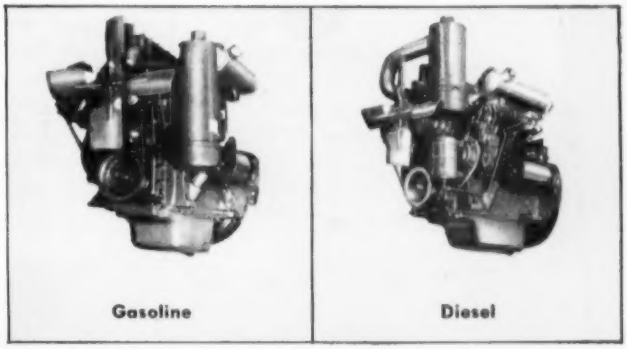
BIF METERS FEEDERS CONTROLS

Universal frame for dozer blades, snow plows

Rear fork lift carrier

All-purpose, 7-cubic-foot scoop

with everything!



Gasoline | Diesel

Most powerful tractor of its type!

Not only the most powerful, but a huskier, heavier tractor and the *only one* to offer a choice of diesel or gasoline power. Two modern, low-friction, 4-cylinder engines designed to keep your costs at an absolute minimum. Now you can pick the power that fits your needs the best and cuts your costs the most!

Here is the tractor you have been waiting for. A tractor with all the features you have wanted... all the features that make other tractors its size outdated! Waiting for diesel power? Super 55 has both diesel and gasoline. Want a tractor you can use anywhere, with any kind of attachment? Try the Super 55... its greater power, weight... its compact, maneuverable size... and its ability to take front-, rear- or side-mounted tools gives you versatility never before had in any tractor! Just look—

SIX FORWARD SPEEDS—with a new super low of 1½ miles per hour. Gives greater power at slow speeds, less chance of engine stall-out. Straight-through shift from first to reverse low—makes quick reversing easy.

LOW AND COMPACT—only 4½ feet high. Built low to the ground for stability, yet has a 21-inch axle clearance. 6-foot wheel base makes tight turns easy in close quarters.

BUILT-IN HYDRAULIC SYSTEM—internal control for 3-point hitch equipment. External control for mounted equipment. Mounted and 3-point tools may be operated together or separately without closing either system.

DOUBLE-DISC BRAKES—give four times the braking surface, yet require half the foot pressure of band brakes. Sure, safe, positive braking forward or back.

EASY STEERING—recirculating ball-type steering mechanism reduces operator fatigue. Makes steering in soft ground tight and maneuvering much easier.

See it, drive it, learn the facts!

Stop in at your Oliver Industrial Distributor. Look this new tractor over. Get behind the controls and give it a try. You'll like the profit-making features of this high-performance, powerful Oliver Super 55. See it today!

The OLIVER Corporation I-5
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Please send free illustrated catalog on the new Super 55 Tractor.

Name.....
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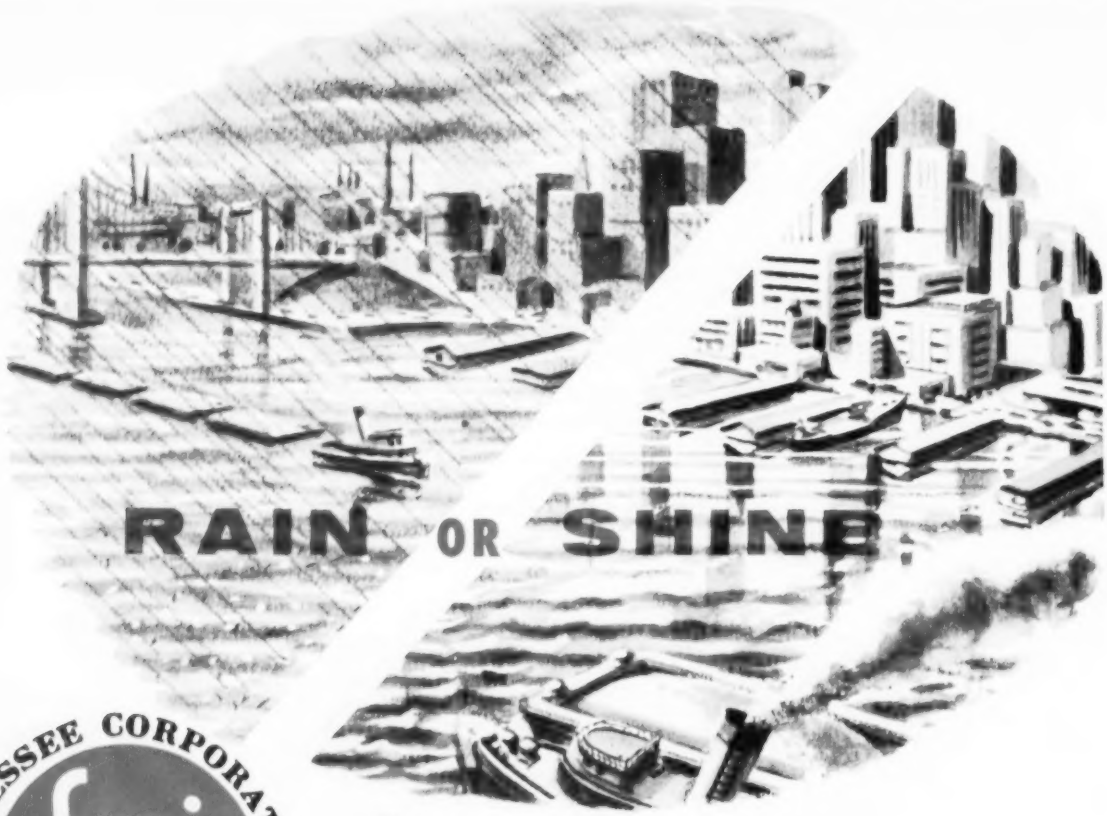
Get full details of this month's products... mail your Readers' Service card today.

Now's the time to mail this month's Readers' Service card.



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Answers Your Water Treatment Problems

A Superior Coagulant With These Advantages:

1. *Rapid Floc Formation* 2. *PH correction* 3. *Taste and odor control* 4. *Color removal* 5. *Softening* 6. *Ease of operation* 7. *Bacterial removal* 8. *Manganese and Silical removal* 9. *Turbidity removal* 10. *Economy*

SULPHUR-DIOXIDE SO_2

SULPHUR-DIOXIDE is effectively used for dechlorination in water treatment and to remove objectionable odors remaining after purification.

COPPER SULPHATE

COPPER SULPHATE will control about 90% of the microorganisms normally encountered in water treatment plants more economically than any other chemical.

Regardless of the weather, your water treatment problems, or the degree of turbidity of your surface water, Ferri-Floc, as a superior coagulant, will meet your water treatment requirements. Ferri-Floc is a partially hydrated Ferric Sulphate which converts high turbidities without radical dosage changes. Only mildly hygroscopic, it can be stored in closed hoppers over long periods of time... permits safe and easy handling.

Water Treatment

Ferri-Floc coagulates surface or well waters, and it aids taste and odor control. It is effective in lime soda-ash softening, and is adaptable to treatment of practically all industrial water or wastes.

Sewage Treatment

Ferri-Floc coagulates waters and wastes over wide pH ranges. It provides efficient operation regardless of rapid variations of raw sewage, and is effective for conditioning sludge prior to vacuum filtration or drying on sand beds.

Samples, Specifications and Detailed Information Available upon Request.

TENNESSEE CORPORATION

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FREE EQUIPMENT DATA to Help Your PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the coupon, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field.

Full Line of Weapons for Snow and Ice Battles

209. Whether your snow problems are heavy or light, you'll find equipment for virtually all your needs among the plows and spreaders offered by Good Roads Machinery Corp., Minerva, Ohio. The "Champion Line" of Vee plows and one way and reversible plows with safety blade trip will handle snow removal; for chlorides and abrasives spreading there are five "Jet Line" spreader models and the 4-U towed spreader. Further details available by checking the coupon.

Why Cities are Shifting to Pak-Mor Collection Bodies

216. Reduced costs of refuse collection with 12 to 50 yard bodies; faster loading; dense compaction; quicker emptying; sealed doors and simple controls are among the advantages cited in 16-page booklet describing Pak-Mor refuse collection equipment. Get full data from Pak-Mor Mfg. Co., Box 6147, San Antonio, Texas, or check the coupon.

Be Sure to Investigate Truck Shovels

229. Adaptable truck-mounted "Quick-Way" shovels can keep on the job steadily in all your maintenance and construction programs. Many new features and engineering advancements described in latest bulletins from "Quick-Way" Truck Shovel Co., 2401 E. 40th Ave., Denver, Colo. Check the coupon today.

What Equipment is Needed By Modern Community Services?

328. The importance of modern equipment in work programs is graphically illustrated in the 16-page booklet "Allis-Chalmers Offers New Economy for Villages, Townships, Counties, Cities, States, Federal." Action photographs span the range of community projects and illustrate tractors, scrapers, graders, power units and their multi-purpose attachments. Get this handsome booklet and review your needs today. Allis-Chalmers Mfg. Co., Tractor Div., Milwaukee 1, Wis. Check the coupon.

What You Should Know About Soil Sampling

241. A complete line of soil sampling tools for hand and power operation are fully described and illustrated in Bulletin No. 25, issued by Acker Drill Co., Inc., Scranton 3, Pa. Applications of each type of tool are indicated. Get your copy by checking the coupon.

Complete Protection Of Iron and Steel Products

242. What are the advantages of Hot-Dip Galvanizing? Why does it offer complete protection at such an economical cost? You'll find the answers in the attractive booklet "Stop Rust", which gives you the full story of the process plus a comprehensive coating comparison chart. Get your copy promptly by checking the coupon or write American Hot-Dip Galvanizers Assn., Inc., 1st National Bank Bldg., Pittsburgh 22, Pa.

Cleaner Plowing Without Obstruction Worries

254. Dependable "Trip-Rite" snow plow trip action does away with danger and annoyance of obstructions even at high speeds. Sturdy toggle joint arrangement minimizes shock and rights plow blade in split second action. Complete information is offered by Davenport Besler Corp., 2305 Rockingham Rd., Davenport, Iowa. Check the coupon now.

Vacuum Cleaning Answers Leaf Problem

210. The Gledhill-Eliotte vacuum leaf loader quickly sucks wet or dry leaves from the street and deposits them into a collection truck for easy disposal. All-season use for roadside cleanup. Get details on this labor-saving maintenance unit from Gledhill Road Machinery Co., Galion, Ohio. Just check the coupon.

Portable Bituminous Mixer Will Discharge into Trucks

264. The Tower Loader, available on either the 10 or 14 cu. ft. Kwix-Mix bituminous mixer, conveniently loads bituminous mix into trucks, overhead hoppers or stockpile. Be sure to investigate these labor saving mixers and the Tower Loader. Literature offered by Kwix-Mix Co., 3029 W. Concordia Ave., Milwaukee 16, Wis. Check the coupon.

New M-B Packer Body Designed for Maximum Payload

295. The M-B Packer Body, designed to provide maximum payload on a minimum size, low-cost truck, features effective, simple compaction system; provides easy loading, positive discharge, all safety features. Available in 12-14-16 yd. capacities. Get all the facts from M-B Corporation, New Holstein, Wis. by checking the coupon.

FOR MORE LISTINGS SEE PAGES 40 TO 58

Windrow Loader is Tailor Made for Majority of Highway Needs

296. The peculiar problems of windrow loading require in most cases a medium capacity, low cost, highly maneuverable machine. To meet these needs Barber-Greene Co. now has a 4 cu. yd. per min. Windrow Loader, readily mounted on a wheel tractor. Further details may be obtained from Barber-Greene Co., Aurora, Ill. by checking the coupon.

Fast, Safe Brush Cutting In Hard to Reach Places

301. The light weight, power driven brush cutting attachment which is operated by standard models of the Lombard chain saw provides a tool with great economy on land clearing operations. Initial investment is far less than separate chain saw and brush cutting machines. For literature and full description check the coupon. Lombard, 65 Main St., Ashland, Mass.

Informative Bulletin Discusses Versatile Sewer Structures

334. Choice of the right type of sewer structure involves consideration of installed economy, long life, easy handling and fast assembly. For a helpful discussion of these important factors and a convenient table for selection of the most suitable type of structure get Folder CMS 6154 by checking the coupon. Armco Drainage & Metal Products, Inc., Middletown, Ohio.

9-54

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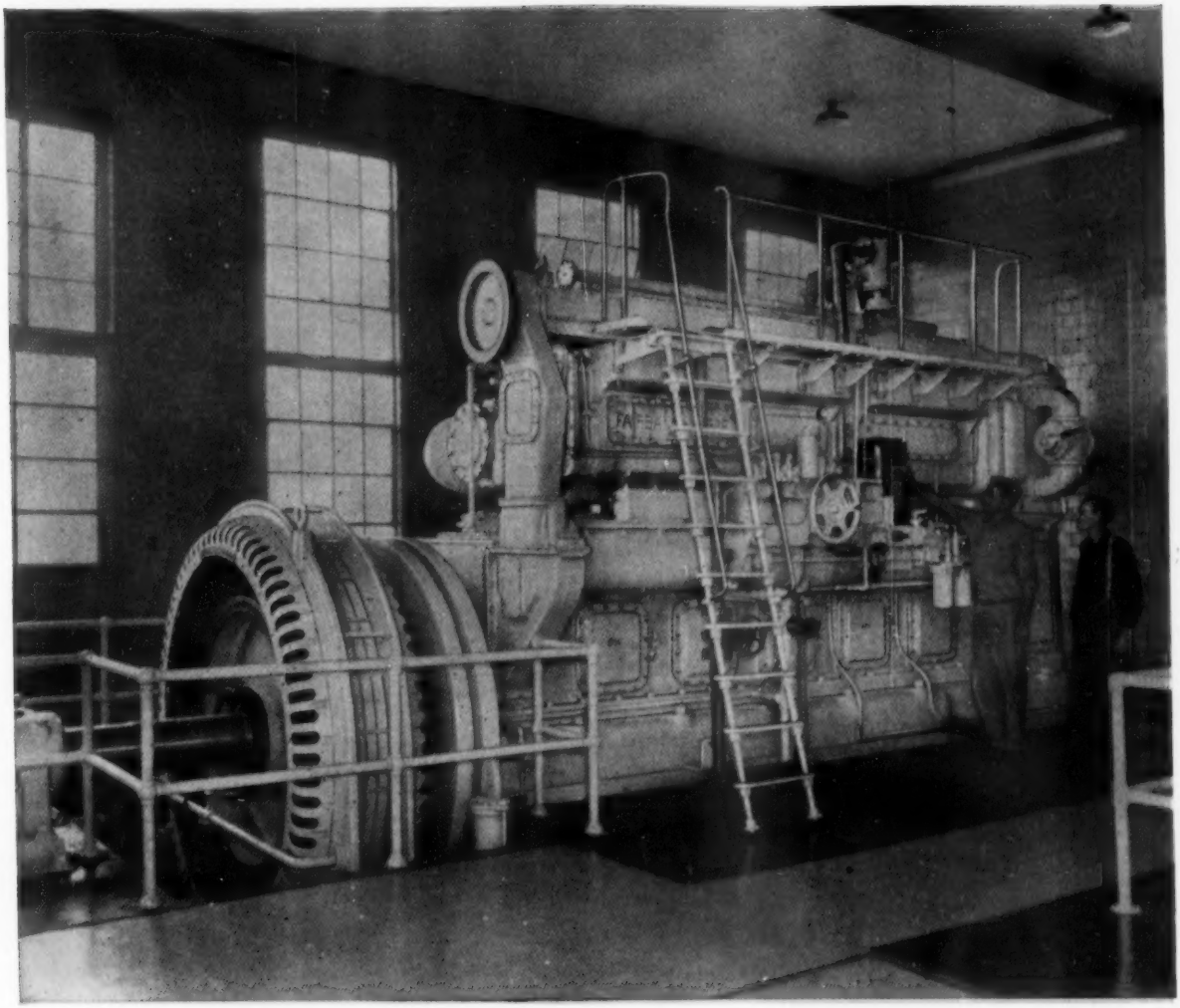

New Fairbanks-Morse Dual Fuel Engine Retires $150,000 Bond Issue!

When put in service in June, 1950, the 1000-hp. Fairbanks-Morse Model 33FD16 quickly established itself as the most economical engine in the Forest City, Iowa, plant. In a 29-month period, 7,336,260 Kw-h. were generated, at an average fuel cost of 3.89 mills per Kw-h. . . . just half the plant's previous cost. To date the engine has not required a single repair or part replacement.

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NEW LISTINGS (Cont.)

Economical Answer to The Leaf Raking Job

231. The Turbo-Jet power leaf mill makes it easy to have neat, leaf-free lawns; gets at hard to reach places; sucks up leaves and pulverizes them to a fine mulch; does the work of ten men with rakes. For full information write to Turbo Jet Mfg. Co., 22 Bowman Terr., Cincinnati 29, Ohio, or use the coupon.

Rugged Trencher Mounts on Truck Chassis

308. The Samson digger, a backhoe-crane-shovel combination mounts on a standard truck chassis; takes a big bite for trenching up to one yard per minute. Powerful hydraulic system and quick controls speed construction and maintenance jobs for all departments. Use coupon or write Avery Tractor Inc., U. S. 20, West Lebanon, N. Y.

Reduce Valve Operating Work —Investigate the Flowtrol

353. The Golden-Anderson Flowtrol valve, designed to replace troublesome globe, angle, plug or gate valves that require frequent manual operation is described in 8-page technical bulletin W8-A of Golden-Anderson Valve Specialty Co., 1244 Ridge Ave., Pittsburgh 33, Pa. Available in 2" to 36" sizes. Check coupon for full data.

Complete Information On Fire Hydrants

377. The 12-page Bulletin "G" of Rensselaer Valve Co., Troy, N. Y., contains complete information on design and operating features of the Rensselaer fire hydrant. Line drawings and sectional views show installation, servicing, spare parts and extensions as well as the "O" Ring Seal and mechanical joint ends that fit centrifugal cast, cast iron pipe and Class 150 Transite pipe. Get your money by checking the coupon.

Technical Data Offered On Flow Tubes

378. The new short differential producing metering device, the Dall Flow Tube, is fully described in Technical Bulletin 115-L3 issued by Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I. Sections include installation data, capacity tables and graphs and all pertinent engineering information. Check the coupon today.

Dozer-Loader Combinations Increase Tractor Output

379. Details on dozer-loaders of ¾, ½ and 1-yd capacities which feature easy mounting on crawler tractors are presented in an illustrated bulletin by Teale & Co., Box 308, Omaha, Nebr. Investigate the Teale dozer-loader now. Just check the coupon.

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Engineering Data on Lighting Standards

321. Five models of Millerbernd lighting standards, all featuring long-life Octa-Tubes cold-rolled of corrosion resistant extra-strength steel are described in Bulletin OTA of Millerbernd Mfg. Co., Winsted, Minn. For this helpful bulletin and full engineering details check the coupon today.

Automatic Proportioning Unit For F&P Chlorinator

376. Automatic adjustment of chlorine feed to proportion of main line flow rate is accomplished by the Fischer & Porter Automatic Proportioner, described and illustrated in Catalog 70-20 of Fischer & Porter Co., Hatboro, Pa. Available by checking the coupon.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

How Cities Clean Sewer Lines From Street in One Operation

25. In a helpful 28-page handbook of sewer cleaning methods and equipment the makers of OK Champion sewer cleaners give full details of power and hand operated models. Also included are data on expansion buckets that take dirt from sewer to street in one operation, root cutters and other accessories. Get your copy by checking coupon. Champion Corp., 4752 Sheffield Ave., Hammond, Ind.

Packaged Sewage Treatment— Just Right for Small Places

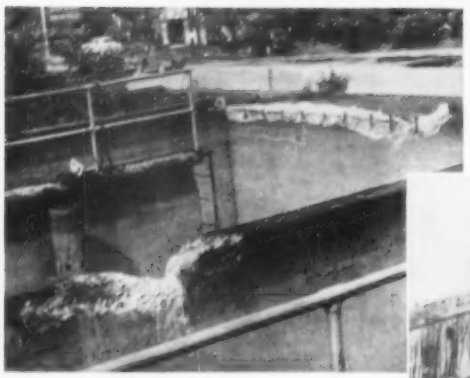
36. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 622 Diversey Pkwy., Chicago 14, Ill.

Book Tells How to Control Root Stoppages

249. Details on the proven use of copper sulfate to control root and fungous growths in sewers are contained in a brand-new book published by Phelps Dodge Refining Co., 40 Wall St., New York 5, N. Y.

To order these helpful booklets check the coupon on page 38.

THOROSEAL *Restored* this Filtration Plant



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Example of complete break-down of masonry, due to penetration of water into body of concrete and action of frost in damp masonry.

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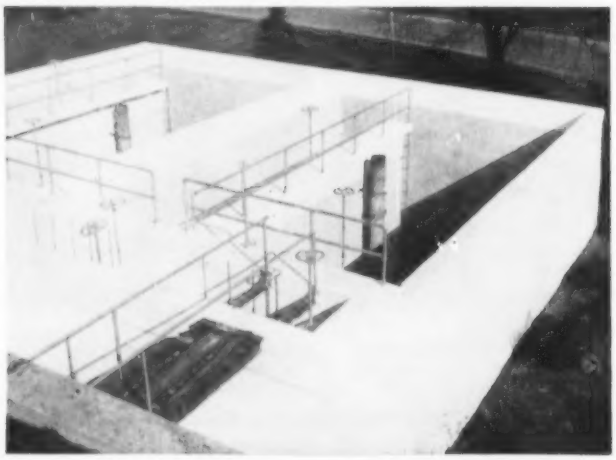

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How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrution, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P. W., Adams, Mass.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete, easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 40-page booklet issued by Flexible Sales Corp., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included. Check the coupon for your copy of this helpful handbook.

Helpful Design Data For Sewage Ejectors

81. The application and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking coupon.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers. Requests for this valuable booklet must be made on business letterhead.

What You Should Know About Design and Use of Concrete Sewers

122. Every engineer and contractor should have a copy of the 48-page book "Concrete Sewers" in his library. This valuable text, published by the Portland Cement Assn., 33 W. Grand Ave., Chicago 33, Ill., gives an authoritative discussion of hydraulics, sewer design, construction and maintenance. Generous use of helpful illustrations makes the book attractive and helpful to the reader. For your copy, just check the handy coupon.

A Short Course In Pipe Jointing

169. The story of rubber couplings for clay and concrete pipelines is graphically presented in the booklet "Pipe Enterprise", published by Hamilton Kent Mfg. Co., Kent, Ohio. Detailed description of pipe jointing methods; photos showing jobs where Tylox gaskets met the need for easily assembled, permanently tight joints installed under all conditions; and a report on the development, manufacture and outstanding features of the compression type gasket make this booklet valuable to every engineer and contractor. Check the coupon for free copy.

Sewer Capacity Speedily Restored By "Reboring" Service

178. An attractive brochure offered by National Power Rodding Corp. describes their mobile unit with specially designed power rodding drive and central mechanism that gets on the job fast; rebores clogged sewers and drains cleanly and safely without impending traffic or disturbing property. Check the coupon or write National Power Rodding Corp., 4600 West Madison Ave., Chicago 44, Ill.

What You Should Know About Rotary Distributors

199. An authoritative discussion of distributors for low and high rate filtration at municipal and industrial waste treatment plants has been presented in a 20-page booklet by the Dorr Co., Engineers, Barry Pl., Stamford, Conn. Unit sizes range from 20 to 200 ft. diameter and capacities from 60 to 22,000 gpm. Trickling filter processes and applications, design features, hydraulic and mechanical factors and other related material are covered fully in this helpful booklet. Check the coupon for your copy.

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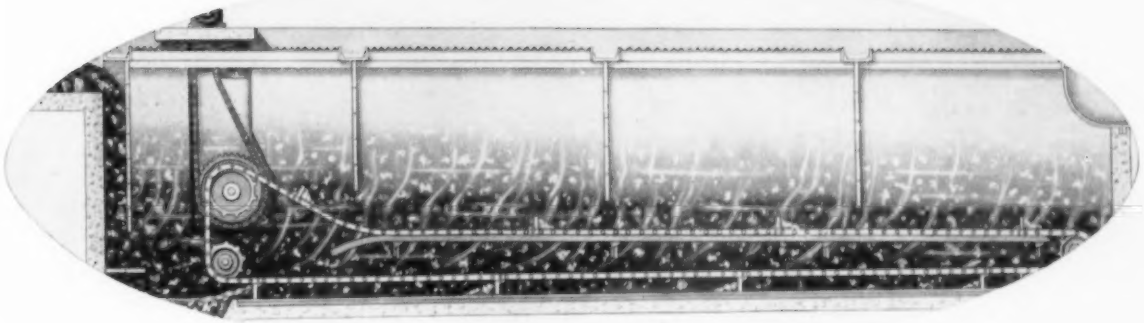

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How to Design Chemical Feed Systems

179. In a 12-page booklet published by Proportioneers, the many factors which enter into the design of a chemical feed system are discussed, and the types of systems used described in detail. These include dry feed, both volumetric and gravimetric and solution feed of the decanter and positive displacement pump types. Feeder controls are considered in detail. Send now for File No. RP-9080 by checking coupon. Proportioneers, Inc., Providence 1, R. I.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833. Detailed information is provided on bar screens, grinders, grit collectors, "Jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use coupon or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

Data Offered On Mixed Flow Pumps

201. Data on the complete line of Worthington Mixflo pumps of the two-vane, non-clogging sewage type is offered in 16-page bulletin W-317-H16. Salient features are outlined, typical sections, performance curves and general data for five types are included. Helpful charts aid shafting selection. Copies available by using coupon or from Worthington Corp., Harrison, N. J.

Indicating, Recording and Totalizing Meter

218. For accurate measurement of water, gas, air, sewage, sludge, etc., the Simplex Valve & Meter Co. Philadelphia 42, Pa., has developed the Type H.-Meter. This mercury flow type indicating, recording and totalizing unit operates in conjunction with Venturi tubes, flow nozzles and orifice plates. Full description of this meter and installation data in comprehensive Bulletin 402, available by checking the coupon.

Design Data on the Circuline Sludge Collector

237. All the information you need for the design of circular settling tanks using the Link-Belt Circuline sludge collector will be found in 20-page Book No. 1982 published by Link-Belt Co., Colmar, Pa. Capacity tables, suggested sizes for all piping and design details are included. Check the coupon for your copy of this valuable booklet.

Chemicals Used in Water, Sewage and Waste Treatment

248. A 16-page technical bulletin offered by Omega Machine Co., 345 Harris Ave., Providence, R. I., compiles in convenient form full information on the chemicals used in water, sewage and waste treatment. Data includes formulas, common names, commercial strengths, forms in which they may be obtained, sizes of shipping containers, and many other items, including recommendations for handling and feeding. Get this useful bulletin by checking the coupon.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy coupon or write Combustion Engineering Inc., Raymond Div., 200 Madison Ave., New York 16, N. Y.

Information Offered on Industrial Waste Treatment

356. Applications of Graver equipment in the treatment of industrial wastes are demonstrated with the problem-solution-result type of explanation in a bulletin published by Graver Water Conditioning Co., 216 West 14th St., New York 11, N. Y. Get Bulletin WC-116 checking the coupon.

Modern Methods and Materials For Joining Sewer Pipe

227. In a compilation of reprints and related supplementary material, the Atlas Mineral Products Co., Mertztown, Pa., presents a comprehensive review of all types of sewer jointing materials and methods. You will find this interesting and informative reading. Get a copy by checking the coupon.

Helpful Data on Bermico Pipe Fittings

280. Data are now available on fittings for use with Bermico sewer pipe and perforated pipe—T's, Y's and bends to make complete root-proof, water tight, corrosion-resistant Bermico pipe systems. Get full information by checking to coupon. Brown Co., 150 Causeway St., Boston, Mass.

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What's Your Digging Problem? Repair Work? Trenches? Footings?

35. At today's prices, hand digging means the job will be costly. You can dig through asphalt and macadam, work fast and efficiently even in cramped areas with the tractor mounted Sherman Power Digger. From one position you can reach to dig 14 feet behind tractor in 140° arc and dig to a depth of 10 feet. For full details check the coupon. Sherman Products, Inc., Royal Oak, Mich.

1,001 Profitable Uses For Holmes-Owen Loader

39. The addition of a Holmes-Owen Loader to your dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy coupon for full data. Ernest Holmes Co., Chattanooga, Tenn.

Safety Lantern With Pencil Beam Signal

70. Get information on the Dietz "Night Watch" Safety Lantern with special globe design that saves fuel by intensifying light rays into a pencil beam. Full details available from R. E. Dietz Co., Syracuse, N. Y. Just check the coupon for full data.

Inexpensive Ditcher Handles Heavy Digging

91. The Shawnee Scout Ditcher, a new, heavier model for extensive digging has been added to the Shawnee line of ditchers and dozers. All models are designed to handle ditching and backfilling operations quickly, efficiently and at low cost. Full information on this equipment will be sent by Shawnee Mfg. Co., 1947 N. Topeka, Topeka, Kansas. Just check the coupon.

Be Sure to Check Your Tractor Shovel Need

94. A comprehensive 16-page catalog now available from Frank G. Hough Co., 761 Seventh St., Libertyville, Ill., shows how cities, counties, contractors and others use the Model HR four-wheel drive Payloader on earth and material handling jobs. Be sure to check the ways you could use this machine. Get Form No. 225 by checking the coupon.

How to Get Better Grader Operation

111. A most interesting and instructive 20-page illustrated action booklet on how to operate a motor grader is now available from Galion Iron Works & Mfg. Co., Galion, Ohio. Designed to help operators get more effective use from the versatile motor grader, this booklet covers the hydraulic system, steering, tips on leaning wheels, proper blade positioning, turning, gear speeds and operating procedures. Colorful, easy-to-read presentation guarantees good readership. Check the coupon for your copy.

To order these helpful booklets check the coupon on page 38.

Streamlined Data on Tractors, Scrapers and Power Units

102. The complete line of International Industrial Power products, 73 in all, is described in a new 48-page catalog just published by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. Technical data has been streamlined, yet provides abundant descriptive material on each piece of equipment. Check the coupon for the latest on crawler and wheel tractors, scrapers, dozers and related attachments, plus International Diesel, gasoline and gas power units.

Excavating Machines Engineered for Performance

119. A complete line of excavating and materials handling machines in 10 to 60 ton—¾ to 2½ cu. yd. capacities are offered by Osgood-General, Marion, Ohio. Several bulletins give details on special features that increase efficiency and reduce maintenance. Check the coupon for full information.

One Basic Unit with Attachments Does a Multitude of Jobs

149. You'll find full descriptions of the Davis Pit-Bull unit and versatile, easy-to-change attachments in the handsome new bulletin of Mid-Western Industries, Inc., 1009 S. West St., Wichita, Kans. There's a loader, trencher, dozer, roller, mower, rotary broom, post auger, crane, hammer and lift fork—units for every type of municipal maintenance and construction job—all coordinated for use with the same powerful basic unit. Be sure to investigate this remarkable equipment. Get the full story by checking the coupon.

How Air Placement of Concrete Will Help on Your Jobs

215. There are hundreds of jobs that can be done easier and cheaper by air placement of concrete; reservoir, tank and pool linings, concrete maintenance of all sorts are just a few of the applications. Get full details on two models of the high speed, easily operated "Bondactor" from Air Placement Equipment Co., 1009 West 24th St., Kansas City 8, Mo. Check the coupon.

Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah, Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the coupon today.

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234. Insto-Gas torches and furnaces give trouble-free service for lead melting, soldering and all other jobs where a steady, clean, hot flame is needed. Convenient cylinders require no regulating gauges and attach directly to standard furnace assembly. Full details from Insto-Gas Corp., 1977 E. Woodbridge St., Detroit 7, Mich. by checking the coupon.

What A Road Roller Should Give You

325. Many engineering design features that make Buffalo-Springfield rollers the answer to your needs are described in an attractive bulletin covering the C-Model Two-Axle Tandems of Buffalo-Springfield Roller Co., Springfield, Ohio. Included are details on open gridwork for better operator visibility, increased ground clearance and bevel gear drive. Investigate these and many other features listed in Farm No. S 61-53. Check the coupon.

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96 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH control and description of comparators, colorimeters and similar devices. A 96 page booklet. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

Data on Cutting-In Valves, Repair Sleeves and Accessories

33. A variety of Clow products for installation and repair of cast iron pipe lines, including the Eddy cutting-in valve and sleeve, split sleeves for pipe repair, test plugs, valve boxes, Strickler pipe cutters and other fittings and accessories are featured in literature available from James B. Clow & Sons, Inc., Box 6600-A, Chicago 80, Ill. Check the coupon.

Helpful Data on Water Works Products

49. A completely new catalog covering the entire line of water distribution and service products offered by the Mueller Company, of Decatur, Ill., is now available to engineers and water works superintendents. The 328-page catalog features an easy-to-use sectional indexing arrangement to facilitate quick reference to any of the hundreds of products listed. A large section of useful engineering information is included. Check the coupon today.

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Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal, control of certain tastes and odors, plus other aids in high quality water production. Check coupon for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

Theory and Application Of the Flow Tube

84. Hydraulic formulae, head capacity curves and test data for this primary metering element are given in a technical bulletin, "Theory and Application of the Flow Tube," available from Foster Engineering Co., Union, N. J. Check the coupon for a copy.

Water Treatment Unit For Small Supplies

87. A complete-package water treatment unit to treat 5 to 100 gallons per minute is described in Bulletin 1870, issued by Infilco Inc., Box 5033, Tuscon, Ariz. Unit softens, clarifies, sterilizes or removes organic matter, tastes or odors. Requires a minimum of attention. Investigate this unit whenever dependable treatment is needed for small domestic supplies. Check the coupon today.

Floatless Liquid Level Controls

92. Complete descriptions of electrode type floatless liquid level control systems, including control units, electrodes and fittings, panel assemblies and diagrams of typical installations for all types of municipal service are covered in the 32-page catalog of Charles F. Warrick Co., 1956 W. Eleven Mile Rd., Berkley, Mich. Check coupon for your copy.

Methods of Chlorinator Control

98. Chlorinator control methods include manual, semi-automatic, program, rate, fully automatic proportional and split feed control. To assist the chlorinator user and his engineer or technical adviser in the selection of the control method best suited for each requirement, a publication of Wallace & Tiernan, Inc., describes these methods in detail. You can get a copy of Publication TA-1013-C by checking the coupon.

Useful Data on Butterfly Valves

100. Complete descriptions and tables of dimensions on the full line of Rockwell Butterfly Valves are contained in several bulletins published by the company. Construction details and special control features are illustrated. Write W. S. Rockwell Co., Eliot Street, Fairfield Conn.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

How Engineers and Contractors Can Get This Comprehensive Water Control Apparatus Catalog

141. A 250-page catalog showing the full scope of Rodney Hunt water control apparatus is now available for distribution to consulting engineers, contractors and others actively engaged in water control construction work. Hundreds of diagrams, detailed descriptions and specifications show all types of sluice gates and related items, and a special section provides helpful engineering data. Send your request on business letterhead or use the coupon, stating your occupation. Rodney Hunt Machine Co., 7 Water St., Orange, Mass.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

Comprehensive Data on Cast Iron B & S Pipe

114. Full specifications, including A.S.A. which give all dimensions of standard and alternate patterns of American Mono-Cast Centrifugal Bell and Spigot Pipe in 3" to 48" sizes, will be found in a comprehensive booklet furnished by the American Cast Iron Pipe Co., Birmingham 2, Ala. Check the coupon for your copy.

Makes Underground Pipe Installation Easy

115. One-man operated hydraulic pipe pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts ask for Form E-213, Greenlee Tool Co., Rockford, Ill. Just check the coupon.

Discussion of Ranney Method For Municipal Water Production

116. A very interesting study of municipal and industrial water supply problems and a complete discussion of Ranney Collectors for water production will be found in a 20-page booklet published by Ranney Method Water Supplies, Inc., Box 277, Columbus 9, Ohio. Water quality, construction methods, costs, performance and other topics are considered. Check the coupon to get your copy.

Vertical Turbine Pumps For Municipal Water Supply

121. Engineering data on vertical turbine pumps for deep or shallow well operation in capacities ranging from 50 to 10,000 gallons per minute, oil or water lubricated, are covered in a booklet issued by Worthington Corp., Vertical Turbine Division, Succasunna, N. J. Check the coupon today for this helpful information.

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2½" to 14½" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered.

Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precaulked bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

Helpful Data on Sluice Gates

158 In a well-organized 48-page catalog you will find complete engineering and design data on Pekrul sluice gates, headgates, automatic flap gates, lifts and accessories. Numerous models in 6" to 92" sizes are available, and all pertinent data will be found in this helpful booklet. Write Morse Bros. Machinery Co., Denver, Colo., or use the coupon.

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the coupon or write F. B. Leopold Co., Inc., Dept. PW, 2413 W. Carlson St., Pittsburgh 4, Pa.

Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. Get full details by checking the coupon. Trojan Mfg. Co., 1114 Race Dr., Troy, Ohio.

To order these helpful booklets check the coupon on page 38.

What You Should Know About Steel Reservoirs and Standpipes

163. In a handsome 24-page booklet "Horton Steel Reservoirs and Standpipes," the Chicago Bridge & Iron Co., Chicago 4, Ill., shows installations from 50,000-gal. to 10,000-000-gal. capacity with several types of roof and special architectural features. Engineering data includes information on capacities, foundations and improved surface protection. Check the coupon to get your copy.

Heavy-Duty Pipe Cutter Works In or Out of Trench

164. Built to stand the most severe service, the all-purpose Ellis & Ford pipe cutter, for cast iron water mains 4" through 12", is easy to use in tight places, works in or out of trench. Full details on cutter and interchangeable parts in Catalog 37, available by checking coupon. Ellis & Ford Mfg. Co., Ferndale 20, Mich.

Pipe Joint Essentials and Couplings for Every Job

168. Superior pipe joints are tight, flexible, simple, strong and economical. Dresser's handsome 34-page bulletin No. 513 shows how these essentials are met and provides layouts for curves, working pressures and a wealth of other data. Be sure to check this bulletin on the coupon. Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

Need Data on Swimming Pool Equipment?

180. Every type of swimming pool equipment—boards, ladders, slides, safety equipment and related accessories—fully described and illustrated in attractive folder issued by American Playground Device Co., Anderson, Ind. All units feature modern design and superior construction to give lifetime service. Check the coupon for this attractive folder.

Locate Mains, Services and Leaks Without Digging

186. A 16-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes, cables, valves, manhole covers, conductive and non-conductive sewer pipes and septic tanks by electronic means. Dry battery operated. Only one man is needed for operation. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif., by checking the coupon.

Assistance in Planning Electrical Systems

189. On every water and sewage plant expansion, modernization or new construction job, you can get valuable assistance in planning the electrical system from Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. Be sure to investigate compact, unitized Westinghouse equipment which conserves building space and simplifies maintenance. Check the coupon for full data.

New Ring-Tite Joint For Transite Pressure Pipe

251. Ring-Tite, the new coupling for Transite Pressure Pipe, is the subject of a 6-page illustrated folder just issued by Johns-Manville, 22 East 40th St., New York 16, N. Y. Time-saving installation methods and economies made possible by the use of this coupling are explained. Check the coupon for your copy.

Manual Covers All Types Of Pipe and Service Repairs

266. Full details on the entire line of Skinner-Seal pipe repair clamps, service fittings and drilling equipment are presented in a new catalog and service manual offered by the M. B. Skinner Co., South Bend, Ind. Step-by-step installation pictures and captions give clear, concise instructions for the repair of all types of pipe leaks. Get helpful Catalog GW by checking the coupon.
let gives full details. Check the coupon today.

Factors to Consider in Elevated Tank Selection

299. Details on the several different types of elevated steel tanks, including capacity ranges, tank dimensions and other factors to be considered in the selection of elevated tanks for modern water storage, plus discussions of new tanks for old towers and foundations are included in Bulletin 101 of the Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Check coupon for your copy.

11 Attachments .. to 1 Basic Unit

CUT INVENTORY— LABOR—MAINTENANCE!

the PIT-BULL . . .

- MOUNTS ON REAR OF FERGUSON OR FORD TRACTOR.
- HAS FOUR SPEEDS EACH DIRECTION AND INSTANT REVERSING.
- PERMITS CLEAR VISION AND PERFECT CONTROL.
- ATTACHMENTS ARE EASY TO CHANGE.

Replace your high-cost equipment with the high-quality yet economical Davis ***Pit-Bull***. Only one basic unit . . . but several easy-to-change attachments set you up to handle a multitude of jobs without a big investment in equipment and payroll. The ***Pit-Bull*** is strictly a one-man machine that can be used to load . . . dig . . . sweep or to do many other jobs with a minimum of time spent changing attachments. You buy only the attachments you need.

The ***Pit-Bull*** turns your Ferguson or Ford tractor into a powerful industrial unit. A syncro-mesh transmission with underdrive is installed by the dealer to give you four speeds in either direction and to allow you to change without shifting gears.

A reversal in the seating and steering controls, plus installation of finger-tip ***Pit-Bull*** controls, permits the operator to be *comfortable* and maintain complete control of both the tractor and the ***Pit-Bull*** simultaneously. The ***Pit-Bull*** gives greater versatility, maneuverability, visibility and performance at only a fraction of the cost of conventional equipment.

Ask your dealer for a demonstration or write for details.

The Davis PIT-BULL is manufactured by the makers of the Davis Model 100 Loader, America's Quality, Front-End Tractor Loader.


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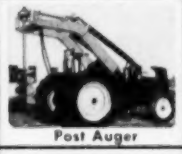
Post Auger


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Swinging Crane


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Model 100 Loader

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MID-WESTERN INDUSTRIES, INC. 1009 S. WEST ST., WICHITA, KANSAS

To order these helpful booklets check the coupon on page 38.

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking coupon.

Helpful Data On Pipe Tools

230. Toledo drop head ratchet threaders are light, compact, ideally suited for work in tight corners. Three models for ⅛" to ¾"; ⅛" to 1¼"; and ½" to 2" pipe all feature quick change of sizes. Get Catalog 12A53 from Toledo Pipe Threading Machine Co., Toledo, Ohio. Check the coupon.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in a convenient booklet offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the coupon.

Instrumentation and Control Equipment For Water and Sewage Plants

298. Full engineering data on the instrumentation and control equipment needed in water works, sewage plants, pumping station and related installations are provided in the "Application Engineering Data" binder issued by the Foxboro Co., Foxboro, Mass. Every engineer and designer should have this valuable material on hand. Check the coupon if you can use this data.

New Advantages In Boiler Construction

309. Get the latest data on cost-saving tube-supported wall enclosures for large and small boilers from Bigelow-Liptak Corp., 2550 W. Grand Ave., Detroit 8, Mich. 12-page booklet gives full details. Check the coupon today.

Trencher Fits Municipal Needs

315. A bulletin describing the Cleveland Model 95 trencher has been published by the Cleveland Trencher Co., Cleveland 17, Ohio. The Model 95, called "The standard machine for city and suburban work", is versatile, maneuverable and economical for use on water lines, service lines, road widening and all utilities trenching. Get this 8-page illustrated bulletin by checking the coupon.

Convenient Data on Water Works Fittings

327. Complete data on water works brass goods and allied fittings, including curb stops, corporation stops and couplings, lead gooseknecks, meter fittings, service boxes and drilling and tapping machines is furnished in convenient form by Hays Mfg. Co., Erie, Pa. Be sure you have this information in your files. Check the coupon.

Engineering Data on Lubricated Plug Valves

355. Full information on Homestead lubricated plug valves in full-port and venturi types, sizes up to 14", and with a choice of self-seald two-piece plug or one-piece plug designs. Engineering information includes principal dimensions, types of control, metals, lubricants, etc. For your copy write Homestead Valve Mfg. Co., Coraopolis, Pa., or check the coupon.

All About Centrifugal Pumps

361. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use coupon or write to Fairbanks, Morse & Co., Dept. P. W., Chicago 5, Ill.

Boltless Tapping Sleeves Speed Installations

370. Boltless tapping sleeves for cast iron and asbestos-cement pipe offer top economy by eliminating caulking, cutting down excavation and speeding up installations. Be sure to investigate this new product. Write Corey Mfg. Co., 329 Verdugo Rd., Los Angeles 65, Calif., or check the coupon.

SNOW AND ICE CONTROL

Uniform Salt Spreading Saves Material

145. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on this spreader and table of material application rates. Use coupon or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Ice Control Without Corrosion Dangers

208. Virtually all corrosion is prevented when rust inhibitor "Banox" is used in conjunction with salt for snow and ice control. Properties of this material and performance results are described in bulletins issued by Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa. Check coupon for your copies.

Get Full Data On Aggregate Spreaders

286. Accurate control for spreading crushed rock, chips, sand or ice control materials is featured by all models of Highway Equipment Co. materials spreaders. Data on both trailer and tailboard types available by checking the coupon. Highway Equipment Co., 630 D. Ave., Cedar Rapids, Iowa.

Snow Plows for Every Street and Highway Need

335. For details on the full line of Frink Sno-Plows including the new taper-type reversible plow with hydraulic roll-over control, reversible trip-blade plows, Vee plows and all accessories, check the coupon today. Frink Sno-Plows, Inc., Clayton, N. Y.

CIVIL DEFENSE

Electric Power Wherever You Need It

75. Electric power for every job—for construction, maintenance and emergencies—is always available for the owner of a convenient Homelite carryable generator. These compact, gasoline engine operated units are made in a variety of sizes to suit every power requirement. Get full details by writing Homelite Corp., Port Chester, N. Y., or check the coupon.

Get the Facts on Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Sign and Signal Corp., 8733 So. State St., Chicago, Ill., by using coupon.

Auxiliary Electric Power For Public Utilities

130. Full descriptive information on Onan electric plants for every public utility need will be found in literature issued by D. W. Onan & Sons, Inc., Minneapolis 14, Minn. Be sure you have latest data on standby plants and controls for emergency electric power. Check the coupon now.

Two-Way Radio Equipment For All Departments

363. The benefits of two-way radio communication in the uncongested non-interference 450-megacycle range make full information on this subject important to all engineers. Get full data on trouble-free systems from Motorola, Inc., Dept. PW, 4545 Augusta Blvd., Chicago 51, Ill. Just check the coupon.

THE ALL NEW HEIL

- FAST CYCLE TIME
- SIMPLE OPERATING MECHANISM
- EASY SERVICE ACCESSIBILITY
- LOW LOADING SILL
- NO DOWN TIME FROM JAMS
- BULLDOZER TYPE PACKING PLATE FOR BETTER PACKING

Here's the completely new Heil Colectomatic containing all the best features suggested by municipal operating crews, inspectors, supervisors and private refuse collection operators. The result is the simplest, safest and easiest-to-operate-and-service collection unit on the market for fast, clean, economical refuse pick-up!

See the New COLECTOMATIC at the American Public Works Congress
Spaces
A-68, 69, 70 and 71
Atlantic City Auditorium
September 19-22

CLEAN, ODOR-FREE COLLECTION because liquids cannot drain out of the body to the street or back into the hopper.

SHORT, OVERALL LENGTH AND HEIGHT make the Colectomatic easier to handle in narrow alleys and restricted areas.

BALANCED WEIGHT DISTRIBUTION results from forward location of the tailgate hinges which puts more of the tailgate weight on the truck longitudinals rather than hanging over them at the rear of the body.

ONLY THREE HYDRAULIC CYLINDERS REQUIRED — two for packing and tailgate operation and one for dumping—none of which can be damaged from corrosion by direct contact with refuse and garbage.

FITS STANDARD TRUCK CHASSIS —cab-over-engine or conventional models—102" CA single axle or 84" CA tandem axle.

ATTRACTIVE APPEARANCE and clean body lines have definite eye-appeal and advertise modern sanitation methods to citizens and visitors alike.

QUIET PACKING OPERATION UNDER ALL CONDITIONS with no continuously moving chains and only slight engine acceleration for packing operations.

NO RETAINER PLATE necessary since packing plate holds load in body.

PUSH BUTTONS at the rear connected to buzzer in the cab signal driver when pick-up is completed.

RIDING STEPS at rear, bucket and shovel hooks included as standard equipment.

COMPLETE SAFETY TO COLLECTORS, children and bystanders is assured by the entirely enclosed packing mechanism which prevents material from flying back out of the hopper.

SEND FOR BULLETIN BH-54103 for the complete story or see your nearest Heil Body and Hoist distributor for a demonstration.

COLECTOMATIC

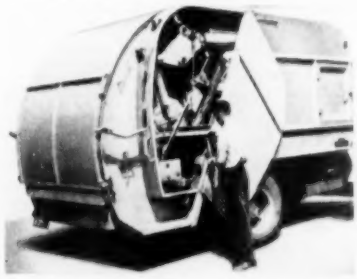
THE FIRST SANITARY REFUSE COLLECTION UNIT EVER DESIGNED BY YOU—THE USER!

FLAT BODY FLOOR of the Colectomatic has no wheel housings or ramps over which refuse must be pushed either when packing or dumping. Three inch body taper from front to rear assures easy, swift discharge.

FINGER TIP CONTROL actuates automatic packing cycle. A flick of one lever closes the safety door, sweeps the load into the body and packs it, opens the safety door for the next load—all in an average time of 22 seconds.

LOW, WIDE LOADING SILL with plenty of headroom and elbow-room allows two collectors to easily empty refuse at the same time with minimum effort. Hopper height is same as truck chassis longitudinals.

STOPPAGE CONTROL SAVES TIME, PREVENTS DAMAGE if anything should stick between hopper and packer plate. Quick, simple adjustment drops hinged hopper away from packing plate. No time lost digging out jammed material.



EASY ACCESSIBILITY FOR SERVICING is provided by a 3-section door on each side of the body. Doors can be opened quickly and easily to expose entire working mechanism so it can be serviced from a standing position.

FAST DUMPING of the Colectomatic is assured by one Heil precision-built hydraulic cylinder which raises body to 45° dumping angle (50° optional). Ample clearance between raised tailgate and ground allows easy drive-away after dumping.

FAST BULLDOZER-ACTION LOADING CYCLE FOR BETTER PACKING...

With the hopper filled, the finger-tip control closes the safety door and automatically the packer plate moves backward as the hopper rises.

Packer plate forces refuse out of hopper into the body, continues to roll the refuse with a bulldozing action exerting 22 tons of pressure against material.

When packer plate reaches farthest forward point of its course of travel, the hopper is completely emptied and returns to loading position.

With hopper back in place, packer plate remains at forward position retaining the refuse in the body and safety gate opens for the next load.

THE HEIL CO.

G8-42

DEPT. 4494, 3044 W. MONTANA ST., MILWAUKEE 1, WIS.

Factories: **Milwaukee, Wis. — Hillside, N. J.**

Heil Sales Offices: **New York, Union, N. J., Washington, D. C., Atlanta, Cleveland, Milwaukee, Detroit, Chicago, Kansas City, Denver, Dallas, Los Angeles, Seattle**

To order these helpful booklets check the coupon on page 38.

WEED CONTROL

What You Should Know About Chemical Weed Control

132. In a convenient 44-page book, the C. B. Dolge Co. gives full details on spraying procedures and chemicals to use for control of lawn and roadside weeds, ragweed eradication and insect control in turf. Get your copy by checking the coupon or write C. B. Dolge Co., Westport, Conn.

TRAFFIC SIGNS

New Reflectorized Sign Faces Refurbish Old Traffic Signs

292. Get complete details on new "E-Z-On" traffic signs faces ready for immediate shipments. Reflectorized faces cost only a fraction as much as new signs and are easily attached to existing traffic signs. Use the coupon for data today. Grace Sign & Mfg. Co., St. Louis 18, Mo.

REFUSE COLLECTION AND DISPOSAL

New Roto-Pac Features Speed Refuse Collection

50. Features of the Roto-Pac refuse collection unit, which include automatic continuous loading and packing, with increased power to provide for larger loads in the same size body, are described in bulletins issued by City Tank Corp., 53-09 97th Pl., Corona, L. I., N. Y. Check the coupon now to learn how your collection problems can be eased.

Engineering Data on Incinerator Appurtenances

171. Charging and ash gates, water sealed ash hoppers, ash scraper conveyors, pneumatic ash conveyors, skip hoists and covering equipment to minimize odors and reduce labor costs are among the many incinerator appurtenances described in literature of the Beaumont Birch Co., 1508 Race St., Philadelphia 2, Pa. Check the coupon for this data.

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy coupon.

Get Latest Data On Colecto-Pak Units

243. A feature-packed, two-color bulletin telling all about the Colecto-Pak garbage collection unit has been issued by the Heil Co., Milwaukee, Wis. Action photos and cutaway views show the ease of loading and unloading and illustrate the effective compacting arrangement that means bigger loads and lower costs. Get the full story by checking the coupon.

What You Should Know About Refuse Incinerators

362. Two helpful bulletins tell what you should know about low cost refuse incineration for the small community and for larger cities. Your questions on mechanical stoking, burning rates and operating problems are discussed. Get Bulletins 217 and 223 from Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y. Just check the coupon.

Efficient Landfill Operations For Small Communities

349. Step-by-step photos and concise text are used in a bulletin of the Oliver Corp., to show the construction and operation of a sanitary landfill, using equipment especially suitable for the smaller community, the Oliver OC-3 Tractor-Loader. Besides providing economical refuse disposal, many other jobs handled by this unit are suggested. For a copy, write to the Oliver Corp., 400 W. Madison St., Chicago 6, Ill. or check the coupon.

STREET LIGHTING

Investigate These Street Lighting Standards

366. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards by using the handy coupon. Check these strong, well designed, yet inexpensive steel standards for practical street and highway lighting. Handsome folder also includes data sheets on floodlighting and area lighting standards. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn.

STREETS AND HIGHWAYS

Do You Have Complete Black Top Equipment Data?

41. In 36-page catalog AA a full line of maintenance is covered. Units described and illustrated include several models of pressure distributors, supply tanks, sprayers, brooms, asphalt kettles, portable rollers, and accessory tools. Use coupon for copy of this handy manual. Littleford Bros., 452 E. Pearl St., Cincinnati 2, Ohio.

Need more facts about advertised products? Mail your Readers' Service card now.

To order these helpful booklets check the coupon on page 38.

Concrete Saw Cuts Patches, Trenches, Contraction Joints

85. Savings of up to 50% in labor and materials is claimed by sawing repair patches or trenches for sewer, water, gas lines in concrete or asphalt. In new concrete construction sawed joints control contraction cracking and eliminate costly hand formed joints. Full information on how you can economically saw concrete from Clipper Mfg. Co., 2823 Warwick, Kansas City, Missouri. Check the coupon.

Cut Resurfacing Costs With Manhole Adapters

137. There is a WB "Manhole Adapter" to fit every street opening and for varying elevations to suit your resurfacing job. Be sure to check this way to maintain structural strength, reduce traffic interference and save time and labor. Get full data from WB "Manhole Adapter", 1320 McGee St., Kansas City 6, Mo. Check the coupon.

Black-Top Paver Offers Many Advantages

150. The flexible Adnun Black Top Paver lays any asphalt mix, hot or cold, in widths from 6 ft. to 13 ft. Careful design lowers operating cost and cuts maintenance. Attachments spread stone, cinders or slag. Get full data on this machine by checking coupon. The Foote Co., 1954 State St., Nunda, N. Y.

Versatile Maintainer Has Year 'Round Usefulness

151. The sturdy Huber Maintainer will work for you the year 'round on maintenance jobs, berm leveling, road planning, bull-dozing, snow plowing, brooming, mowing shoulders and as a patch roller. Good ideas on how to do all these jobs in Bulletin No. M-138. Write Huber Manufacturing Co., Dept. PW, Marion, Ohio.

Better Highways Through Salt-Soil Stabilization

162. Practical information for the men who build, repair and maintain our highways is provided in two bulletins issued by the International Salt Co., Inc., Scranton, Pa. General principles of salt-soil stabilization, applications, plant mix and road mix are described. Check the coupon for your copies.

Self-Propelled Sidewalk Paver Lays Up to 10 Ft. per Minute

203. The Dotmar paver, which can lay up to 10 ft. per minute of sidewalk, may be converted readily to pave curb and gutter or integral curb, gutter and walk. Full details in 8-page Bulletin 53, released by Dotmar Industries, Inc., Kalamazoo, Mich. Just check the handy coupon.

The Bros Line of Road Machinery

289. An illustrated folder describing the Bros line of road machinery is available from Wm. Bros Boiler & Manufacturing Co., Minneapolis 14, Minn. Full descriptions of Bitumimizer distributors, Spraymatic spray bars, several types of compacting equipment and other units are included. Check the coupon.

Hot or Cold Patching Mixtures Prepared on the Job

304. By preparing your patching mixtures, hot or cold, right on the job, you can use them immediately with a minimum of handling. Get full data on the McConnaughay Model HTD "Multi-Pug" Asphalt Mixer for fast, easy and economical preparation of patch materials. Write K. E. McConnaughay, Layfette, Ind. or use the coupon.

A Helpful Booklet For Those Who Build and Maintain Roads

310. "Governmental Graders," a booklet published especially for the 18,000 governmental agencies with jurisdiction over local-rural roads tells how the three sizes of "Cat" motor graders do the job on road building and maintenance programs. Of particular interest is a table of repair costs compiled from public records. Get your copy from the Caterpillar Tractor Co., Peoria 8, Ill., or by checking the coupon.

Patching and Maintenance With Bitumuls

283. Proper maintenance of paved surfaces is the subject of an informative 24-page booklet "Bitumuls for Maintenance" published by American Bitumuls & Asphalt Co., 200 Bush St., San Francisco 4, Calif. Profusely illustrated and well-written, this text gives step-by-step descriptions of patching and other surface maintenance operations. Check the coupon now to order your copy.

What Should You Look For In a Power Sweeper?

206. Helpful information to aid you in the selection of a power sweeper to fit your needs is provided in Bulletin 85.2, issued by G. H. Tennant Co., 2530 N. Second St., Minneapolis 11, Minn. Full data on the highly maneuverable Tennant Model 75 Sweeper is included. Get your copy by checking coupon.

8 Reasons Why You Should Check the Jaeger Loader

207. In a profusely illustrated 16-page catalog devoted to the applications and special design features of the Jaeger "Load-Plus" tractor-loader unit, eight good reasons listed to back up the claim that this machine outproduces any other loader of its size. These include load capacity, balance, reach, maneuverability, automatic power adjustment by torque converter, instant reversal, multiple speed and ease of control. Check them all by getting a copy of Catalog L100-3. Check the coupon today. Jaeger Machine Co., 400 Dublin Ave., Columbus 15, Ohio.

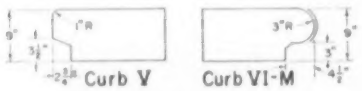
Get Jobs Done Faster With Multipurpose "Scoopmobile"

282. The efficient Model C Scoopmobile cuts time and labor costs with its versatile applications and quick-change accessories. Features power steering; three-wheel maneuverability; scoops, loads, transports, hoists. Get full data from Mixermobile Manufacturers, 8027 N.E. Killingsworth, Portland 20, Ore. Check the coupon.

UP FRONT FOR ADEQUATE ROADS

BY
LEO J. RITTER, JR.

Curb Designs—The California Department of Highways, in connection with the design of its metropolitan freeways, has completed a dynamic impact testing program of barrier curbs of various designs. Results of the study are presented in an article entitled "Barrier Curbs", by J. L. Beaton of the Materials and Research Department, which appeared in May-June issue of *California Highways and Public Works*. Of the 11 designs evaluated, most of which were 9-inch curbs, the two shown below proved to be most effective as barriers.



Traffic Toll — Encouraging news comes from the National Safety Council, which reported that the rate of traffic fatalities hit a record low of 6.3 deaths per 100 million miles of travel in the first quarter of 1954. Ned Dearborn, President of the Council, said "If this improvement should continue for the entire year, the 1954 traffic death toll would be the smallest since 1950".

Leadership—The determination of the present administration to provide leadership in solving the country's highway muddle was forcefully presented in a statement authorized by President Eisenhower and delivered before the Annual Conference of Governors at Boltons Landing, New York, early in July. The President specifically called for a 10-year, federal-state cooperative program to cost $5 billion a year, over and above normal expenditures for the improvement of the country's highway system. Justification of the program was based, in part, upon the appalling highway accident toll and inadequacies of the highway system for defense purposes in event of total war. Highlights of the program included a grand plan for a properly articulated system serving the needs of transcontinental travel; a financing proposal based upon self-liquidation of each project where feasible; a cooperative alliance between the federal government and the states, so that local government will be the manager in its own area; and, probably, a program initiated by the federal government with state cooperation for the planning and construction of a modern interstate highway system. Interest of the federal government seems to assure a high level of highway activity for some time to come; the A.G.C. has already predicted that total highway expenditures may reach $8 billion in the calendar year, 1955.

Recommended Reading—The July issue of *Traffic Quarterly*, published by the Eno Foundation for Highway Traffic Control, Saugatuck, Connecticut, is jam-packed with articles of interest to those who deal with traffic planning and control. For example, there's one on "Enforcing Law on Slow Driving", by Edward Schiedt, Commissioner of the North Carolina Department of Motor Vehicles. There's another on "Transportation Planning in Houston" by Eugene Maier, Director of the Department of Traffic and Transportation of that city. Allan Rogers, Superintendent of Public Works in Garden City, Long Island for many years, tells of that community's approach to the problem of parking in an article called "Parking: Some Retrospective Views". Then, too, there's a review of Maxwell Halsey's new book, "State Traffic Safety: Its Organization, Administration and Programming", published by the Eno Foundation. Recommended reading by all.

Le Voyageur We get a big kick from traveling over the country on

The Washington, D.C. Suburban Sanitary Commission is filling in an old gravel pit on this sanitary landfill operation near Hyattsville, Md. The 29,900-lb HD-9G Tractor Shovel shown here is spreading and compacting refuse on the slopes. Cover material for this job is carried from 75 to 100 ft in the HD-9G's two-cu-yd bucket.

TRACTOR SHOVELS PROVE IDEAL MACHINES FOR SANITARY LANDFILL WORK

Allis-Chalmers Tractor Shovels are made to order for the sanitary landfill system of garbage and refuse disposal. Any one of the four different sizes — one, two, three and four-yard capacities — can do the complete job . . . excavate trenches, spread and compact refuse, apply an even cover of dirt fill.

Allis-Chalmers Tractor Shovels are more than just standard tractors equipped with front-end loaders. They are designed and built as complete units to give the best service possible. Many features like these add to their work capacity: all-steel, box A-frame that carries heavy working strains; extra long tracks and truck frames that give better balance for shovel work; 1,000-hour lubrication intervals for truck wheels, idlers and support rollers that eliminate daily maintenance of these parts; simple shift pattern that allows faster work cycles; unit construction for less down time while servicing. For added versatility, there are attachments that can be quickly interchanged with the bucket to keep the tractor busy on other jobs all year long.

★ ★ ★

See the complete line of Tractor Shovels and bulldozers at your Allis-Chalmers dealer, or write for booklet "Sanitary Landfill, An Important Community Benefit."

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the finest highway system in the world. Do you? One of our latest jaunts took us from New York City up into the New England states, where we had never visited before. Among other high-type facilities, we traveled on the Westchester County, Wilbur Cross, and Merritt Parkways; a portion of Route 128 in Massachusetts, which connects with the New Hampshire and Maine Turnpikes leading to Portland; and the Taconic State Parkway in New York. We felt the impact (and advantages) of the toll-road movement, since our eldest reckoned that we spent $10.80 on road and ferry tolls on our 1200-mile excursion. Beauty spots which we particularly enjoyed included Newport, Rhode Island; Gloucester and Rockport, Massachusetts (Cape Ann); Lake Sebago in southern Maine; the White Mountains in New Hampshire (tremendous); Mt. Mansfield and Stowe, Vermont; and Lake Champlain, Fort Ticonderoga, and Lake George, New York. We traveled many out-of-the-way state routes, particularly in New Hampshire and Vermont. Highways, in general, are very good, although crowded in some areas. Much of New England is beautiful. If you haven't been there, you owe it to yourself to go; they say early fall is *the* time to be there.

Another trip was strictly slambang—from New York to Chicago, which we did in about 18 hours driving time, without really pushing. For our money the Pennsylvania Turnpike is still the finest toll facility we've seen, particularly from the standpoint of interest and beauty. Our worst driving came in Eastern Ohio, particularly around Akron, where narrow, 2-lane roads were clogged with truck traffic. There's no doubt that the Ohio Turnpike is really needed. Man, when the Indiana and Ohio Turnpikes, and the connection between the Pa. and N.J. Turnpikes are finished, you'll be able to *fly* from New York to Chicago.

Available—A 16-millimeter sound, color motion picture "Give Yourself the Green Light", from General Motors Corporation; a 26-minute, non-commercial film devoted to the highway problem. "Highways in the United States", a non-technical, 24-page pamphlet produced by the Bureau of Public Roads; from the Superintendent of Documents, GPO, Washington 25, D.C. (20 cents). A clever bulletin "What Do You Know About Trucks?" from the Automobile Manufacturers Association, 320

Solve Cost and Production Problems with an OSGOOD "250"

Here's important news for contractors, road and bridge builders that need a low priced, low operational cost machine that provides high production performance. It's the job-proven OSGOOD "250".

Actual on-the-job reports show that the "250" digs more payloads at less cost. The reason — outstanding design features, backed by over 100 years of experience in manufacturing powerful, rugged equipment for long, dependable service.

We'd welcome an inquiry and the opportunity to give you more information on the versatile, job-proven OSGOOD "250".

"Equipment Designed with YOUR PROFIT In Mind"

DESIGN FEATURES THAT SPELL STEPPED-UP EFFICIENCY

- **DECK** is rugged . . . full length, one-piece cast steel construction . . . providing a sturdy foundation for the machinery.
- **MACHINERY** is accessible and well-balanced. Chains, gears, and bands are covered for safety and cleanliness.
- **SWING AND TRAVEL CLUTCHES** are of large diameter, with air-cooled drivers and housings.
- **HOIST BRAKES** are large, heavy-duty . . . for smooth and cool operation.
- **POWER PLANTS** . . . Heavy-Duty, Diesel or Gasoline.
- **SHOVEL BOOM** . . . all steel, reinforced and welded into an exceptionally strong unit.
- **CONVERTIBLE** to Crane, Clamshell, Dragline, or to Hoe . . . in the field. Crane boom is lattice type, with all-welded tubular lacing. Crane capacity 24,450 lbs.
- **CRAWLER UNIT** provides exceptionally stable base for superstructure . . . 22" treads standard — 36" optional.

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½ to 2½ cubic yards, truck cranes from 15 to 25 tons, Mobilcranes from 25 to 45 tons and log loaders.

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Get full details of this month's products . . . mail your Readers' Service card today.

New Center Building, Detroit 2, Michigan.

How About That?—A subcommittee of the House Armed Service Committee has recommended the use of asphalt wherever possible for air base paving, suggesting the use of Portland cement concrete only in critical areas. The subcommittee said that the use of asphalt would save approximately $50 million in the Air Force's proposed construction program.

From Here and There—A contract was recently let for resurfacing of 22 miles of the Pennsylvania Turnpike with asphaltic concrete reinforced with steel welded wire fabric. Don't forget about the second annual National Highway Conference of County Engineers and Officials, sponsored by ARBA, which will be held September 13-15 in the Deshler Hilton Hotel, Columbus, Ohio. The Texas Highway Commission has announced a program of $211 million in expenditures in 1955 and 1956, the largest program in the state's history. Rep. Oakman of Michigan introduced into the Federal Congress a bill which, if enacted, would penalize states which levy third-structure taxes (i.e. ton-mile and axle-mile taxes on trucks) by decreasing their allotment of federal-aid funds by an amount equal to that collected by such taxes. The Illinois Toll Road Commission is planning a $500 million program, details of which will be announced soon.

• • •

Highway Maintenance Costs in Missouri

Maintenance costs for Missouri state highways averaged $648 per mile during 1953. Major system highways cost $926 per mile and supplementary and takein roads cost $490 per mile. Farm-to-market roads, which carry only 18 percent of the traffic took 48 percent of the money.

Out of every dollar spent on maintenance, 70 cents went for actual maintenance work—maintaining the base, shoulders, surfaces and approaches, bridges and grade separations, and culverts and drainage. Other necessary operations, as signs, pavement striping, traffic controls, roadside maintenance and improvement, snow removal and ice control, cost 25 cents of each maintenance dollar. The other 5 cents went for various general expenses not readily chargeable to any specific item.

BANOX® TO THE RESCUE!

Banox banishes the threat of salt-slush corrosion from streets and highways. As little as 1% Banox added to de-icing salt puts a stop to salt-slush corrosion damage and makes for substantial savings for motorists and taxpayers.

Salt is more economical,* and faster and safer than old fashioned snow and ice control with abrasives. Banox halts salt-slush corrosion damage to cars, municipal equipment, bridges and other metal surfaces, and in addition, with a salt-Banox mix, there is no costly spring clean up of gutters and catch basins.

Application of Banox is easy and inexpensive. It can be added to de-icing salt by road maintenance crews, needs no special mixing and is evenly distributed by normal traffic movement.

Join the many communities who have already discovered the efficiency and economy of using Banox and salt for snow and ice control without salt-slush corrosion. Send for your free booklet: "Stop, Look and Save with Banox."

*Comparative cost figures for both city streets and highways indicate that you can save as much as $4.27 per mile by using rock salt instead of abrasives.

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visit the BANOX exhibit
Booth C-15
1954 Public Works Congress and Equipment Show

Now's the time to mail this month's Readers' Service card.

PUBLIC WORKS ENGINEERING DATA

New Highway Patching Material Developed in Arkansas

An improved patching material for highways has been developed as a result of research by J. R. Bissett of the University of Arkansas Engineering Experiment Station. In development for more than two years, the material, which has shown much promise, is now undergoing road tests. A blend of kerosene, naphtha and diesel oil is reported to be used. The naphtha evaporates rapidly, providing early stability when placed on the road; the kerosene and diesel oil evaporate more slowly, permitting stockpiling and easy working at a later date.

Short-Wave Radio Speeds Public Works Operation

A short-wave radio system, consisting of seven mobile units and two receiving-sending stations, has been installed by the Public Works Department of St. Joseph, Mich. The mobile units are installed in the trucks and cars of the operating supervisors, of the director of Public Works and of the City Manager. The cost was $4500 and the result has been greatly increased efficiency.

Reclaiming and Reusing Water Softening Plant Sludge

A plant to reclaim and reuse the sludge from its water softening plant will soon be in operation at Lansing, Mich. The waste, which aggregates about 40 tons net weight per day, will be calcined and either used again in the plant or sold for commercial uses.

Cost Data on Sewage Treatment Plant Operation and Maintenance

IN accordance with a suggestion from one of our valued readers, we undertook to obtain data from a number of cities on the costs for sewage treatment. The question headings were broken down into: (1) Population served; (2) operation; (3) maintenance and repair; (4) interest and amortization; and (5) total costs. Rather detailed figures were obtained on 54 trickling filter installations; (29) activated sludge plants; 33 primary treatment plants; and a number of plants of other types.

The results indicate that budgeting and cost keeping in respect to sewage treatment plant operation have no uniformity which permits any reasonable comparison of costs from city to city. In addition, there is no commonly used basis of capacity on which

to base costs. A plant may be designed for two times or more the present flow; or it may be overloaded. For that reason, it was determined to base cost data on population now being served. Whether or not this is a reasonable assumption is perhaps debatable, but is unimportant in the light of the other findings.

In respect to operation, it was found that, in many cases, the figures given included also the cost for operating the sewer system; in some cases it included maintenance and repair costs for either the treatment plant alone or for both it and the sewer system. Operating costs as reported, with the obviously incorrect items deleted, range from 32 cents per capita to $3.08 for trickling filters with an average of about $1.15; from 48 cents to $6.20 for activated sludge plants with an average of about $1.73; and from 32 cents to $3.43 for primary treatment plants, with an average of about $1.17.

When it came to the cost for "maintenance and repair", the same factors cropped up as for operation. Principally, sewer system costs were included; or this item was included in "operation". Possibly in some cases, such money came from a different fund. No reliability could be placed on many of the figures under this item as reflecting sewage treatment plant costs. This, therefore, has been discarded in the compilations except in a few cases where verification was possible.

The "interest and amortization" item also provided unsatisfactory data. In a number of cases, this question was answered by the statement: "All paid off." Another not unusual reply was: "Includes sewer system construction." A number of cities did not answer the question at all, probably because the engineer did not have the data readily available.

There were, however, some usable data. From California came reports on five trickling filter plants. With populations of 7,000 to 30,000, operating costs ranged from 38 cents per capita for one of the largest plants to $2.68. The average was $1.32. This was almost exactly the same as was reported by six California primary treatment plants of the same size range. Four trickling filter plants in Ohio, serving from 11,000 to 30,000 people, reported operating costs ranging from $1.34 to $2.29 per capita, with an average of $1.70; four plants in Pennsylvania, 3,000 to 80,000 population, averaged $1.36 per capita; and four from Missouri, 4,500 to 30,000 averaged 64 cents per capita.

Plants of the activated sludge type in Illinois reported total costs of $1.78 per capita, of which about half were reported as operating costs. The three plants served populations of 7,200 to 96,000. Four Missouri plants, 2,400 to 32,000 population, showed operating costs averaging $1.30 per capita; and four from Pennsylvania, all relatively small, averaged $2.18 per capita for operation.

In general, there is a trend in operating cost according to size of plant. The very large plants tend toward lower per capita operating costs. So do the very small plants, where there may be either a part-time operator, or a man in the low-pay bracket. The intermediate plants—serving 20,000 to 50,000 population—are highest in operating cost on the basis of capacity. For instance, five trickling filter plants serving 30,000 to 45,000 population, reported an average operating cost of $1.71 per capita. On the other hand, 21 trickling filter installations serving less than 10,000 people each reported an operating cost of $1.15 per capita.

1954—BEAUMONT BIRCH'S 50TH YEAR—MANUFACTURERS OF EVERY TYPE OF COAL, ASH AND BULK MATERIALS HANDLING EQUIPMENT SINCE 1904.

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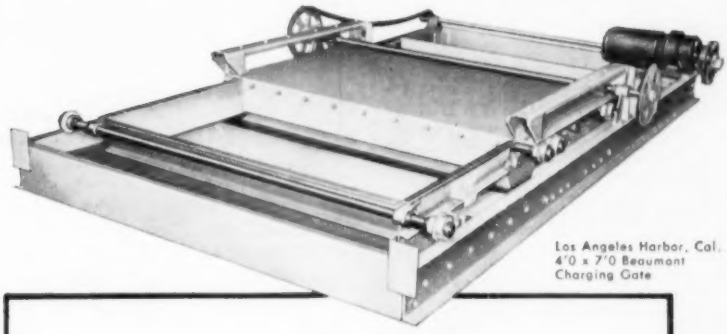
INCINERATOR GATES

installed in *well-known cities by nationally-known incinerator manufacturers.



Los Angeles Harbor, Cal. 4'0 x 7'0 Beaumont Charging Gate

Beaumont charging gates assure continuous, trouble-free operation. Extremely low maintenance. Open-tooth rack prevents jamming of debris between pinion gear and rack . . . permits gate to be operated freely. To meet all requirements, Beaumont charging gates are now available in a wide range of standard sizes. Check the size that fits your requirements below. Write today for complete details.

*RECENT ORDERS

City of Los Angeles Harbor, Cal.
Gate: 4'0" stroke by 7'0" wide
Morse Boulger Incinerator
Greeley & Hansen, Cons. Engrs.

City of Pomona, Cal.
Morse Boulger Incinerator
Gate: 4'0" stroke x 7'0" wide
Black & Veatch, Cons. Engrs.

City of Worcester, Mass.
Nichols Incinerator
Gate: 4'6" x 4'6"
Alex Potter, Cons. Engrs.

City of Hartford, Conn.
Morse Boulger Incinerator
Gate: 4'6" x 4'6"
Metcalf & Eddy, Cons. Engrs.

City of Milwaukee, Wisconsin
Pittsburgh-DesMoines Incinerator
Gate: 3'0" stroke x 4'0" wide
City of Milwaukee, Engrs.

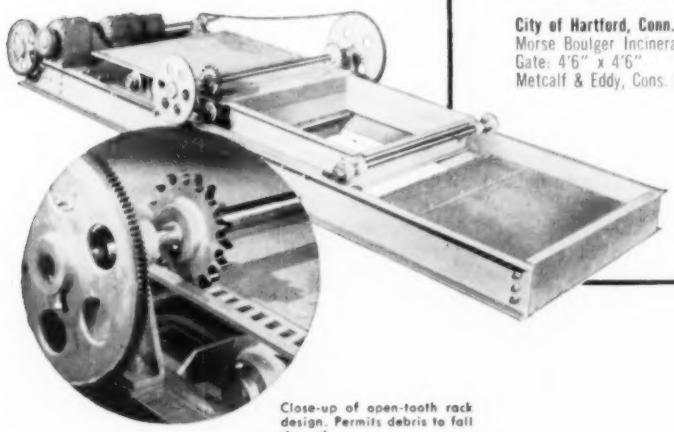
City of Washington, D.C.
Nichols Incinerator
Gate: 4'6" x 4'6"
District of Columbia, Engrs.

City of St. Louis, Mo.
Fleisher-Seggar Kaelber Incinerator
Gate: 4'0" stroke x 3'3" wide
Greeley & Hansen, Engrs.

Town of N. Hempstead, L. I.
Morse Boulger Incinerator
Gate: 4'0" x 4'0"
C. MacCallum, Cons. Engrs.

City of Chicago (Medill Ave.)
American Incinerator Co.
Gate: 3'6" x 3'6"
City of Chicago, Engineers

Town of N. Hempstead, L. I. 4'0 x 4'0 Beaumont Charging Gate.



Close-up of open-tooth rack design. Permits debris to fall through.

WIDTH	STROKE	WIDTH	STROKE
2'6"	2'6"	4'0"	3'0"
2'9"	2'9"	4'0"	3'3"
3'0"	3'0"	4'0"	4'0"
3'3"	3'3"	4'3"	4'3"
3'3"	4'3"	4'6"	4'6"
3'3"	4'0"	5'0"	5'0"
3'6"	3'6"	7'0"	4'0"

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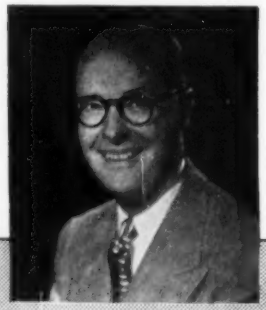
People, Ideas and Events



BY "DOC" SYMONS

H. T. M. A.—And this is the month of the N.Y. Sect. AWWA meeting in Montauk Point, L.I., and a dozen other meetings of interest to water works and sewage works men. Wish I could "make" several of them but I'll have to be content with not straying far from home.

★ ★ ★

Meanwhile I'm still thinking about the AWWA meeting in Seattle and one amusing incident in particular. —When the Fuller Awards were made, Dale Maffit, (incoming AWWA Prexy) read off the name of the awardee from the Chesapeake Section as Edwin Aloysius Schmitt, of Washington, D.C. That's the way the certificate read—but no one, least of all, Ed, had any idea how the "Aloysius" got in there. Ed swears his middle name is something else—O.K., so what is it?

★ ★ ★

At the exhibition hall in Seattle, Joe Lovell, Supt., Water Dept., Murfreesboro, Tenn., was sitting in the booth of the Ford Meter Box Co., talking to several of the Ford clan. Joe said he was surprised that Chevrolet hadn't complained about the number of Fords in the water works business.—On the train coming home I had the chance to get acquainted with Dave Ford, he's understudying John Sr., another nice guy.

★ ★ ★

Heard a real "shoulda stood in bed" story at Seattle from Dick Pearce, Mgr. Chlorinizer Sales Builders-Providence. Seems Dick gave a talk at the Purdue Industrial Waste Conference, and then came on to Seattle with Gerry Riepe, Chicago Mgr. B-I-F Industries. At Purdue, Dick's reservation was for the wrong day; on the train from Chicago to K.C., they got the last room, only to be awakened at 3 a.m. because the car was being taken off for repairs. With no other rooms available they rode in the lounge car to K.C.—Then on to Denver where Gerry remarked that the only thing that hadn't happened to them was for their hotel to catch on fire. —They were awakened by sirens—looked out the window and—their hotel *was* on fire! ! !

★ ★ ★

At one of the AWWA sessions, Vic Weir (Pres., St. Louis County Water Co.) moderated a session on "Breaks in Oil Pipe Line Crossings". The Petroleum industry was represented by men from Texas Pipe Line Co. and Std. Oil and the water industry by Morrison Cunningham (Oklahoma City), John Detweiler (Omaha) and Mel Hatcher (Kansas City). Next day, Ellsworth Filby (Black & Veatch, Cons. Engr.) remarked that, for once in his life, he had actually seen oil and water mix, under the expert hand of Vic Weir.

★ ★ ★

As might be expected, the program at Seattle didn't please everyone, but for the most part there was something for everybody and no one could possibly hear all the papers.—When I hear some one complain, I just put it down to poor breakfast or something. — Anyway the scenery was pretty terrific at Seattle, the entertainment was excellent, the food delightful, and the crowd very friendly. Good convention, I say!

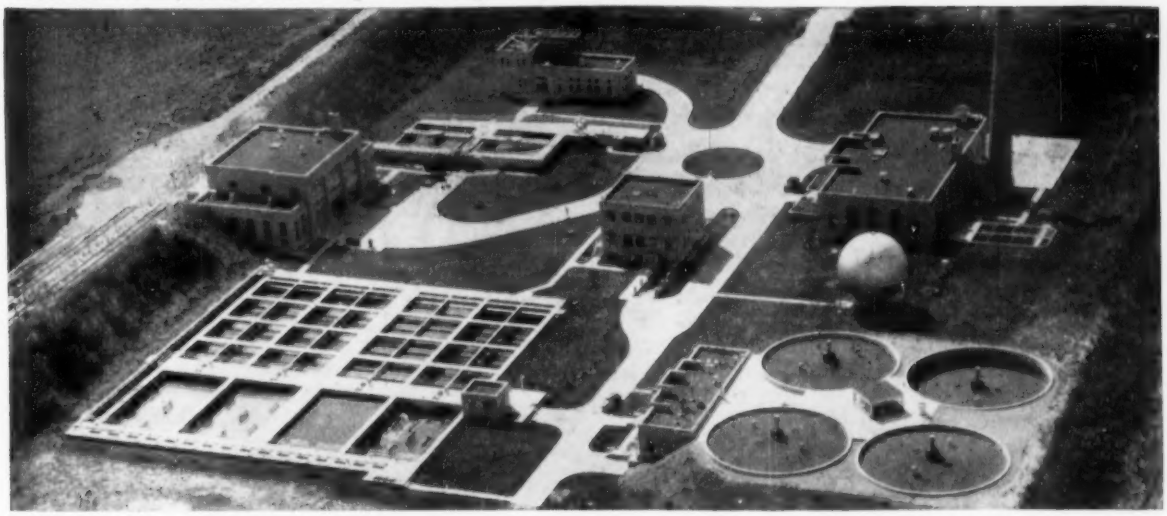
★ ★ ★

Swedefinition—"Subtlety is the art of saying what you think and getting out of range before it is understood.

★ ★ ★

Small World No. 26 — Ten days after I returned from the Seattle meeting, I journeyed to Cornell to

"Little Miami"—first of 4 new sewage treatment plants for Cincinnati's metropolitan area



Cincinnati leads Ohio River clean-up program

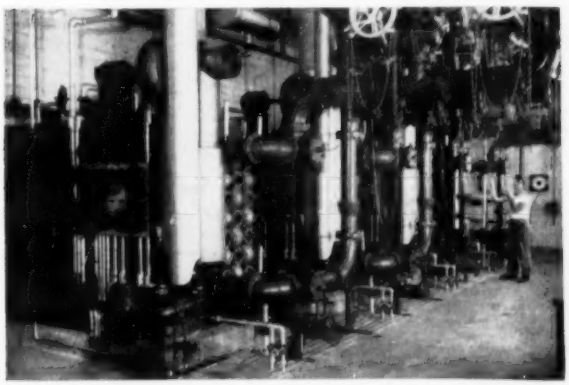
Four-plant, 154 MGD project includes PFT "Controlled Digestion"

Leading an 8-state drive for modern sewage disposal in the Ohio River Valley, Cincinnati recently completed the first of 4 sewage treatment plants to serve the entire metropolitan area. Their splendid new system has encouraged other Ohio River municipalities in this great clean-up program!

Called "Little Miami," the new 29 MGD plant adopted the following items for PFT "Controlled Digestion":

(1) *PFT Floating Covers* in the four 65′ digesters for positive scum submergence, safe utilization of gas and simplified operation.

(2) Four *PFT Cover Position Indicators* to record the liquid level in each digester.



Four No. 750 PFT Heater & Heat Exchanger Units.

(3) Four *PFT Supernatant Selectors* for automatic, continuous withdrawal of the best digester liquor, along with *PFT Gauge, Sight-Glass and Sampler* units.

(4) Four *PFT No. 750 Heater & Heat Exchanger* units to keep digesters at optimum temperatures of 90°-95° F. Fired by sludge gas *or* oil, these units cut fuel costs by utilizing all sludge gas available, automatically changing to oil as necessary. In addition to sludge heating, these units provide heat for the digester control building.

Little Miami will be followed by the 120 MGD Mill Creek plant, the largest of the group. PFT has already received extensive orders for "Controlled Digestion" equipment in the huge new plant including 12 PFT 110′ diameter Floating Covers with PFT Aluminum Prefabricated Roof Decks, and PFT Pearth Gas Recirculation Equipment and 23 PFT External Heat Exchanger Units.

Design of plants by / *Havens & Emerson, Consulting Engineers, Cleveland, Ohio*

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waste treatment equipment exclusively since 1893

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see our son graduate. Graduation week is also alumni reunion week and imagine my surprise—I had hardly arrived on the campus when I saw Robt. C. Dennett, (Consultant, Nat. Bd. of Fire Underwriters), whom I had talked with in Seattle. He was back for his 50th anniversary of the Class of "Naughty Four".

Next familiar face was A. M. (Ted) Roberts, ('09) Pres., Wanakah Water Co. and a short time later I ran into "Bob" Austin ('12) Hydr. Engr., N.Y. State Pub. Ser. Comm.—Next I saw Ed Stapley, ('14) Dean of Engr., Oklahoma A & M., I'd seen him, too, in Seattle and he had driven home from there, then on to Cornell and was on his way to Europe.

Also wandering along the "Quad" I met Allan Rogers, ('24) Supt. of Pub. Wks., Garden City, L.I., but I missed seeing Glen Searles, ('09) of Rochester.

In this water works business, you see friends wherever you go — Small World!

★ ★ ★

While at Cornell, I discovered that S. C. Hollister, Dean of Engineering, is an expert on landscape gardening. He told me not to plant broad leaf evergreens (rhododendron, azaleas, etc.) under maple trees as they're both surface feeders.

★ ★ ★

Luminous Quote—"The safest way to double your money is to fold it over and put it back in your pocket" (From McWane's Pipe Pointers).

★ ★ ★

And about that bet I had with Ric Johnson and Lois Schultz of AWWA.—I had guessed that AWWA membership would reach 10,000 early in July and my predicted figures were:

Date	Prediction	Actual
Mar. 1	9675	9686
Apr. 1	9765	9788
May 1	9850	9890
June 1	9940	9975
July 1	10,000	10,000 plus

They actually hit 10,000 on June 30,—

★ ★ ★

One for the books—At Ajo, N. Mex., water consumers get their cold water from the hot water faucet in summer and from the cold water faucet in winter.—The ground water supply is 80°F or more. In winter it cools down during passage through the distribution system. In summer, consumers find that their

hot water tanks act as cooling devices so that the "hot" water is cooler than that coming direct from the mains—But is the cold water hot enough?

★ ★ ★

Another Swedefinition—"Diplomat—a person who thinks twice before saying nothing".

★ ★ ★

News Notes from Brushy Bend — June 29, the Westchester Water Works Conference (Westchester Co. N.Y.) held its annual outing including the water main tapping contest at Schmidts' Farm in Greenburgh, N.Y.

—July 20, the Northern Section of Illinois Plant Operators met at Elgin, Ill., and heard a panel discussion of Subdivision problems and a paper on Chicago's Metropolitan Area Water Problems.—Vern Johnson of Silvis is Chairman and E. Craig, Zion, Secretary.

—West Shore Water Producers Assn. met at Two Rivers, Wis., on July 21 to discuss mutual problems of Lake Michigan Water supplies. Miles Griffith of Racine, Wis., is Chairman and George Prindle of Highland Park, Ill., is Secy.

See you next month—
V.T.Y.—Doc Symons

• • •

Motorized Sewer Cleaning Machine Reduces Man-Hours Two-Thirds

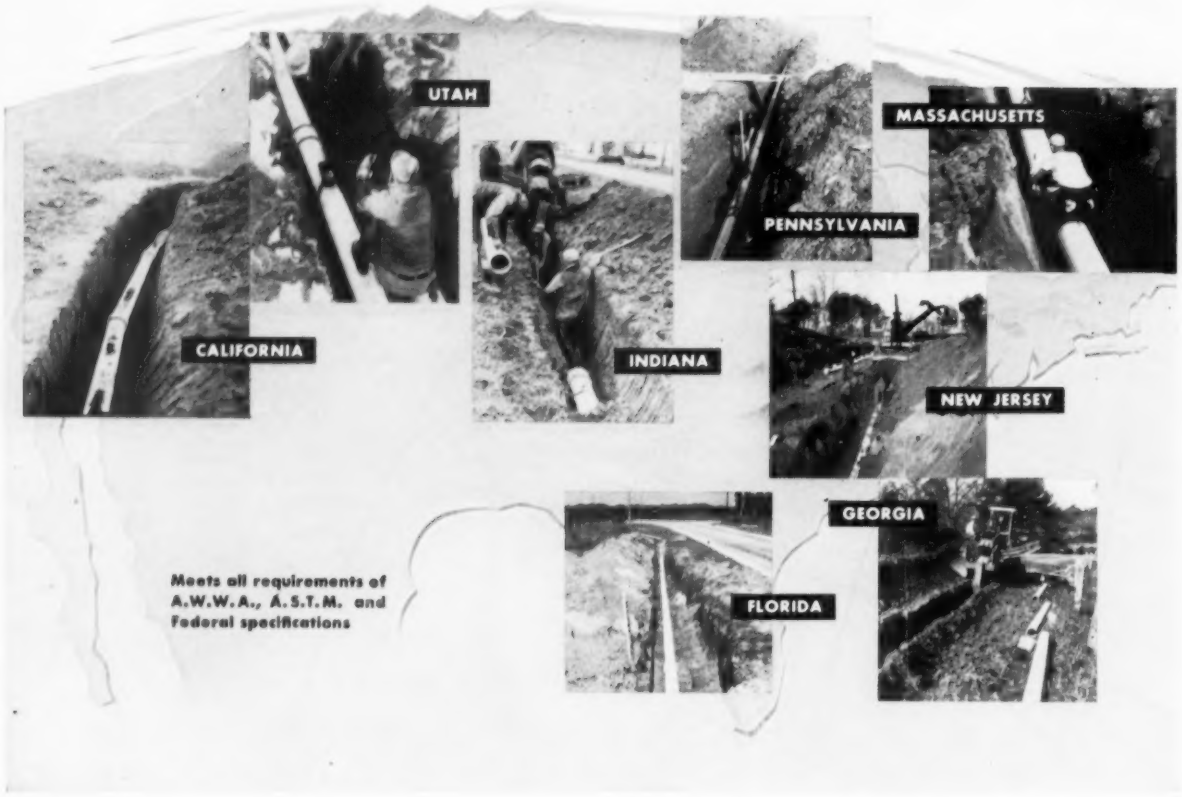
By purchasing and placing in service a motorized sewer rodding machine, the Department of Public Works of San Diego, Calif., has greatly speeded its program. With a crew of two men, this machine cleaned 250,000 ft. of main line sewer in 3,840 man-hours. Hand methods formerly used would have required 9 men and 12,000 man-hours to do the same job. Jean L. Vincenz is Director of Public Works.

• • •

Toledo's Water Softening Plant Will Save Money

It is estimated that the saving to the average family through the operation of Toledo's new water softening plant will be about $8.75 per year. The plant will go into operation late this summer. Water will be softened to about 85 ppm hardness.

Setting new standards–everywhere...



Transite Pressure Pipe and Ring-Tite Coupling speed water line assembly, lower installation cost

IN COMMUNITY after community, proof that Transite® Pressure Pipe and Ring-Tite® Coupling speed water line assembly and cut installation costs is reflected in such contractor comments as these:

"Exceeded by far, the speed anticipated under job conditions."

"Based bid on 400 feet a day, actually laid over 700 feet."

"Established an entirely new concept of installation savings."

These new records for speedy installation have been accomplished despite adverse terrain, weather conditions and the presence of muck and mud in many of these locations. That is why, whatever your water line problem it will pay you to learn all about Transite's many advantages.

* * *

Write for the new Transite Brochure, TR-142-A, Johns-Manville, Box 60, New York 16, N. Y.

JM PRODUCTS

Johns-Manville TRANSITE PRESSURE PIPE

THE ASBESTOS CEMENT PIPE WITH THE NEW RING-TITE COUPLING

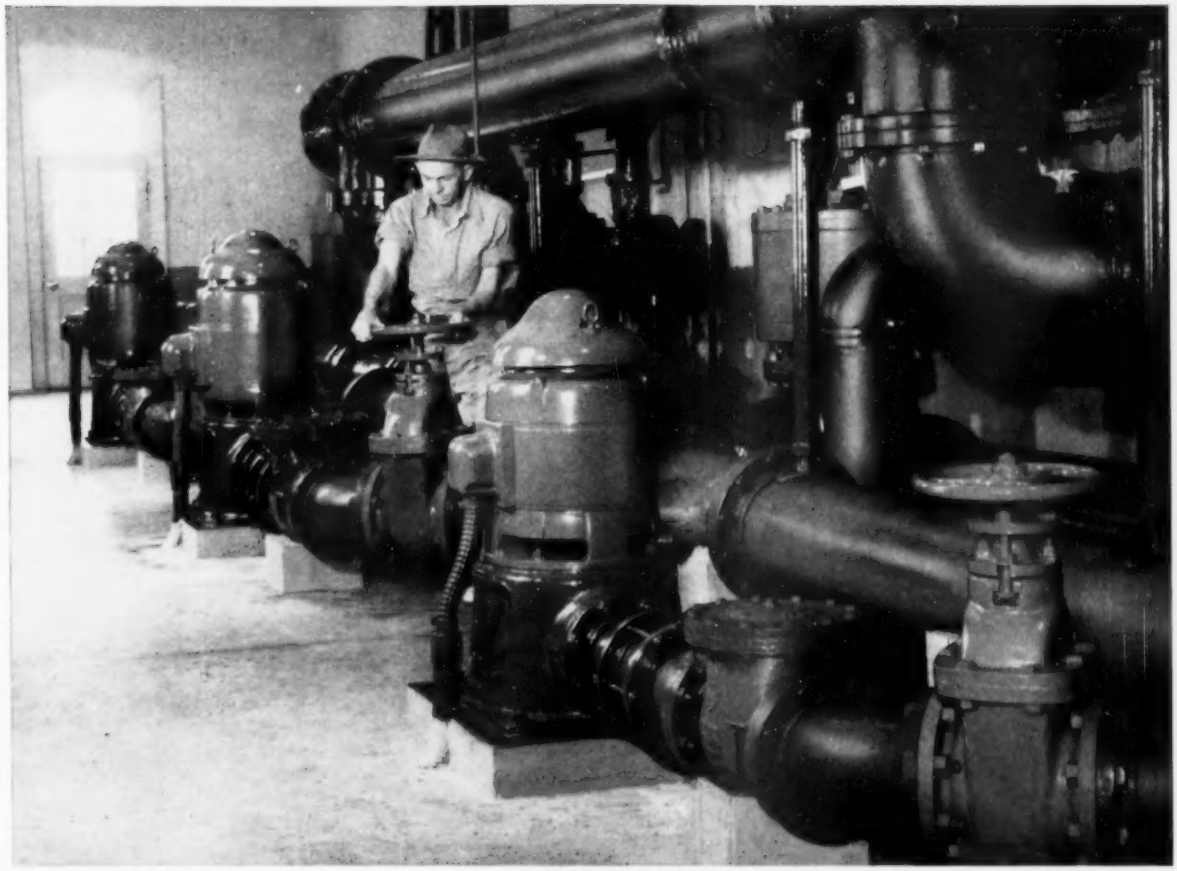
LEADERS IN PUBLIC WORKS

Claude R. McMillan is Chief Commissioner of the South Carolina Highway Department. Following graduation from the University of South Carolina in 1922 with a degree in civil engineering, he was employed by the Southern Bell Telephone Co., but the next year he went with the Highway Department as a junior engineer. He progressed through the organization, serving as maintenance engineer, construction engineer, assistant district engineer, and district engineer. On January 1, 1941, he was made State Highway Engineer, and in 1947, Chief Highway Commissioner.

As Chief Commissioner, he is responsible for the proper administration of all engineering, construction, maintenance and law enforcement functions of the Department. This includes maintenance of almost 24,000 miles of roads and bridges in the state highway system; constructing additional roads as funds become available; and administering the motor vehicle and traffic laws of the state. The highways under his administration now present an investment of $300 million.

He is a member of the AASHO; Southeastern Assn. of State Highway Officials (past president); S. C. Society of Engineers; ASCE; Rotary International; American Legion; and the Alumni Council of the University of S. C. (past president). He is married to the former Miss Mary King of Mullins, S. C., and they have one daughter, Mrs. Thomas Huston Crowe, and two sons, Claude R. McMillan, Jr., and Lt. Harry King McMillan, USN.

His hobbies are those fine sports of hunting and fishing.



THREE WORTHINGTON VERTICAL TURBINE PUMPS lift water 66 feet in the dual-purpose water treatment plant in Pulaski, Virginia.

Pulaski's new plant softens hard water, hardens soft water

Seems that the main source of water for Pulaski, Virginia, is a small impounding reservoir where the water is extremely soft.

When the reservoir runs low, Pulaski draws from a limestone spring. Water here is unusually hard.

To deliver water of uniform quality all year 'round, the Pulaski plant has to soften the hard water — and harden the soft water.

Pumps for this unique plant were supplied by Worthington. Three Worthington vertical turbine units transfer water from the plant's clear well to the general distribution system. Pulaski's engineers are well pleased with the Worthingtons because they take up so little floor space and need no priming facilities or foot valves. The three pumps are installed in a 16-foot deep clear well and lift water 66 feet at exceptionally high pumping efficiencies.

Why not learn how the modern Worthington vertical turbine pump can help in your operation? Write for free Bulletin W-450-B40 to Worthington Corporation, Vertical Turbine Pump Division, Harrison, New Jersey. D.4.28

WORTHINGTON

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

CENTRIFUGAL • ROTARY • STEAM • POWER • VERTICAL TURBINE

CONSERVE GROUND WATER—IT IS A VALUABLE RESOURCE

KEITH COUNTY

compared equipment

—now it's 95% CATERPILLAR!

A Cat No. 12 Motor Grader and a No. 12 with Domor elevating grader team up to elevate and grade a Keith County road preparatory to graveling. Keith's equipment line-up is 95% Caterpillar, including three D7s with bulldozers, one No. 70 Scraper, five No. 12 Motor Graders, a No. 112 Motor Grader, an HT4 Shovel and two No. 12s with Domor elevating graders.

Taxpayers in Keith County, Nebraska, can be sure they're getting their money's worth from their equipment. Their officials *compare* before buying—the best way to get the best machines for any job. Here's what Swan Monson, county commissioner, District No. 1, says:

"I've been commissioner for 13 years. Since I compared them with competitive equipment, I've always used Caterpillar machines. Now this county is 95% Cat-powered. I had a D7 that had worked for 12 years and was still going strong when it was traded in. I had a No. 12 with 14,000 hours with a minimum of down time. The service behind these machines is excellent."

You're looking at two of Keith County's No. 12s in action—one with a Domor elevating grader. The county has seven No. 12s in all and uses them all year round. What makes them standouts for performance? There are lots of reasons—here are some: Only Caterpillar gives you a grader with true *balance* in power, weight and speed. The No. 12's Cat* Diesel Engine delivers its full rated 100 HP—even on low-cost No. 2 furnace oil. For maximum traction, weight is concentrated over tandem drive wheels. And working speeds range from 2.3 to 19.3 m.p.h. through smooth-shifting, constant-mesh transmission.

More reasons! Visibility that gives full view of blade and job from the operator's seat, anti-creep controls that "stay put" under loads and vibration, and a wide range of blade positions without leaving platform and without manually changing blade or lift links. All these and other features add up to more work at lower cost with less down time than any competitive unit!

99 out of every 100 Caterpillar Motor Graders ever built are still on the job. Your Caterpillar Dealer, nearby for service and information, will be glad to show you how these big yellow machines can do more work at less cost for you. Ask for a demonstration!

Caterpillar Tractor Co., Peoria, Ill., U.S.A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

99% OF ALL CAT MOTOR GRADERS EVER BUILT ARE STILL IN USE

PUBLIC WORKS
SEPTEMBER

● SANITARY fill disposal has been exceedingly satisfactory at Amarillo. This shows an Allis-Chalmers Tractor with Tracto-Shovel handling refuse at the fill

The transparencies from which the four-color cuts were made were furnished us by International Harvester Co. and Allis-Chalmers Mfg. Co. The color picture on page 85 is by courtesy of Caterpillar Tractor Co.

PROGRESS in Sanitary Landfill *for Refuse Disposal*

Sanitary Fill Handles 62,258 WEEKLY REFUSE PICKUPS *without NUISANCE*

CLIFFORD L. DAVIS

Personnel Director, Amarillo, Texas

FOR many years this city has been using as an open dump ground for refuse an area in its northeast section. Last summer, the residents of this portion of the city protested vigorously against the resulting odor. Smoke and unsightliness of the dump, impelling the City Commission to consider other means of handling the disposal problem for this growing and spread-out city of 100,000.

Disposal by sanitary landfill was adopted and last December an area was selected in Thompson Park, which covers 640 acres—a square mile—in the northern part of the city. When the fill is completed, the area will be used for a soft-ball field. There are now in Thompson Park picnic areas, tennis courts, a swimming pool, playground equipment and baseball and softball fields. The selection of this area saved a very considerable haul, since the round trip to the old dump required round trips as long as 23½ miles. With an average operating cost of $5.10 per hour or 8½ cents a minute for the collection trucks, every minute saved is important in reducing overall operating costs.

The city purchased an Allis-Chalmers HD-9G diesel crawler tractor with a 2-yard hydraulic control front-end shovel. The first trench dug and completed was 372 feet long, 25 feet wide and 6 feet deep. It held 28,500 cu. yds. of refuse. This was handled in the usual way—spreading from the packer-type trucks, compacting and covering. In practice, when the day's collection is compacted, it is covered with approximately 4 in. of earth obtained from the adjacent trench. As the trucks continue to unload, they drive over the previous day's work, further compacting the waste. When the trench has been filled to capacity with garbage, it is covered with 30 inches of earth.

The second trench completed was 380 feet long, 25 feet wide and 6 feet deep, and held 35,160 cubic yards of garbage. We are now working on the third trench which is 480 feet long, 30 feet wide and 10

feet deep. We have the trench approximately one-half finished, with 39,450 cubic yards of garbage compacted at the close of business on April 8, 1954.

Since starting the third trench, we are supplementing the Allis-Chalmers HD-9G with a used Allis-Chalmers HD-10 and bulldozer. There are twenty 15-cubic yard packing-type trucks dumping in our sanitary landfill. Our work-week is five and one-half days, or 45 hours per week.

We average 3 loads per truck per day. We have 11,328 commercial pickups weekly and 50,930 residential pickups per week, making a total of 62,258 weekly pickups. The average time for commercial and residential pickups per truck is 2 minutes. We spend 120 work-minutes per truck for traveling time to the dump grounds and to the job. The driver is in complete charge of the truck, his route and the two helpers. His salary is $245 per month; the helpers receive a salary of $225 per month.

We have established daily routes with a beginning and ending point whereby the entire residential area of the city is worked twice weekly. This was done with the consent of all of the personnel in the waste disposal department voting by secret ballot. Of the 109 men employed, 102 voted for the daily route system. Under the plan, upon the completion of the assigned route for the daily pickup, the crew has completed a day's work. If the men can complete the route in less than 8 hours, this constitutes a day's work. If it takes more than 8 hours, the crew remains on the route until collections are completed with no overtime.

The tractor operator spots the trucks at the dumping base, and does the excavating, spreading, compacting and covering of the material.

TEXAS DEMONSTRATIONS *show proper Landfill* OPERATING PROCEDURES

STRIKING at the heart of the open garbage dump problem in Texas, the Board of Health of that state recently launched a series of landfill demonstrations that lasted four weeks and included some 225 communities. The prime objective was to demonstrate proper refuse collection, storage and sanitary landfill practices and equipment to towns of 5,000 to 20,000 population throughout the state.

Confident that many of these towns would rid themselves of the open dump if they were shown a more sanitary and economical method of disposing of garbage, the health department set to work. They scheduled a meeting last April to lay the ground work for a number of demonstrations and invited major earthmoving equipment and garbage truck manufacturers to attend. Together, state personnel and representatives from these companies mapped out the plans for the demonstrations. Special invitations to attend the demonstrations were sent to mayors, city managers and public works commissioners throughout the state.

Each demonstration day was divided into a morning and an afternoon session. The morning meeting consisted of a discussion of sanitary landfill collection, storage and disposal principles and of special problems confronting communities in handling their garbage disposal systems. A demonstration of collection equipment by Gar Wood, Pax-All and Pak-Mor companies followed the discussion.

Noon luncheon was furnished by participating manufacturers. The afternoon session was a demonstration of the trench-type sanitary landfill method by equipment of three earthmoving equipment manufacturers—Caterpillar, International—Drott and Allis-Chalmers. Each of these was to have prepared his trench in an area selected by town officials prior to the afternoon of the demonstration. Each of the meetings was attended by representatives of neighboring communities.

The first of the series of demonstrations took place in the Western Texas town of Borger on May 17th. Vernon was next; then followed Snyder, Fort Stockton, Crystal City, Ramondsville, Cuero, Conroe, Jacksonville, Commerce and Mineral Wells. State sanitarians, Reuel Waldrop, George Walker and Robert Peel, alternated in holding the morning discussions in the city halls for the visitors. There they outlined the points of a good sanitary landfill and told how it should be operated. The afternoon session took the town officials out to the dump site where suitable trenches had been dug. Five tractors—a Caterpillar HT4 shovel; a Caterpillar D2 tractor with 'dozer; an International

● **INTERESTED city and health officials watch a Caterpillar HT4 shovel demonstrate methods of sanitary landfill operation at Snyder, Texas. In cooperation with the State Board of Health, demonstrative work was done at 225 communities.**

● **SMOKING, odorous refuse dumps can be made into community assets by proper methods and use of proper equipment.**

TD6 with Drott skid shovel; an International TD9 with Drott bull-clam; and an Allis-Chalmers HD5 Tracto-Shovel—demonstrated how to spread garbage, compact it in a trench and cover it with a layer of dirt.

How successful the demonstrations were in getting rid of open garbage dumps will have to be measured over a period of time. Health department officials are sure of one thing—town officials have started thinking seriously about the matter. This was borne out by many of the comments that followed the demonstrations. Mayor Cecil Newman of Cuero, for instance, had the following to say.

● **PAK-MOR unit unloads refuse into a sanitary landfill trench prior to the Cuero demonstration.**

"We probably always realized that, to a certain extent, our open garbage dump presented a health menace to our town", he stated, "but just how much so was pointed out to us by Mr. Walker (state sanitarian) today. Now we intend to do something about it. Cuero already has a pretty good system of garbage collection set up . . . the charges we make almost pay for the cost of operation. However, now our big problem will be to dig up the money to finance the equipment needed to operate a sanitary landfill. But you can be sure that we intend to whip that problem within the next few years".

Pittsburg's city manager Wynne is also firmly convinced that the sanitary landfill is the answer to his town's garbage problem. "We're all for it", he commented, "but our big problem will be financing it. The city has just completed an extension of paved streets, sewage and water works and now we are feeling the pinch for money. But rest assured," he added, "we'll get around to ridding ourselves of the open dump as soon as possible . . . maybe within a year or so."

Many of the town officials did not have to be sold on sanitary landfill. Typical of this was Ivan P. Oliver, city manager of Marshall. "I just came over to see if I could pick up some good points on the project," he stated, "Marshall started a sanitary landfill last summer and it's about the most economical thing we've ever done. We have a city of 22,000 people and when we started the landfill right next to town, we expected some complaints.

"However, there is no sign of the garbage in the area because we cover it each day and everything is working out fine. And we're saving money because we used to have a five to six-mile haul to the old dump. The whole town is happy about the project."

What do other towns have to say as a result of the demonstrations? Mayor W. F. Newton of Conroe states, "The sanitary landfill appears to be the only logical solution to the open dump problem. We in Conroe intend to give serious consideration to the problem in the near future. We already have some equipment and any other we might need can probably be financed out of garbage collection fees."

David Harner, newly appointed city manager of Jacksonville, and one of the youngest in the state, was

also favorably impressed and stated he was going to work on the town's open dump problem as soon as possible. Many others figure they will air the subject at the next town meeting. Mayor J. T. Beckworth of Mineral Wells is firmly convinced that the sanitary landfill is what his city needs.

"Mineral Wells is prospering," he stated, "We've had a 55 percent increase in population over the past three years. With this new influx of population we are going to have to modernize our garbage disposal system. The open dump west of town will have to go. I think I can safely predict," he added, "that Mineral Wells will have a sanitary landfill in the near future."

State Health officials were pleased with the attendance at the demonstrations and the impressions they created on city officials. Sanitarian Reuel Waldrop reports he has good reason to believe that a sizeable number of Texas towns will rid themselves of the open garbage dump in the near future. However, the health department officials aren't sitting around waiting for results from the series of demonstrations. They are busy working with the smaller towns in the state, showing them how to set up and finance a good garbage disposal system and the sanitary landfill.

Editor's Note: Congratulations to the State Board of Health.

INDUSTRIAL SITES *Created by* SANITARY FILLS

RIGHT now Michigan City, Ind., is working on its third sanitary fill site. The first one, completed some time since, is the site of the Pal-Reo Co., a subsidiary of Reo Motors, which produces a line of playground equipment. The second site will probably be used for a new plant of Dr. Scholl. The area now being used for fill is a city-owned parcel of about 25 acres, about a mile and a half east of the center of the city and between Lake Michigan and US 12-20. The New York Central tracks are on the south border. So this site will be well adapted as an industrial tract; and such a site is needed in this portion of the city.

Sandy soil predominates in this area which is a part of the well-known Indiana dunes. For the most part, the region is one of small, semi-vegetated hills and valleys, the highest hill some 167 ft. above the sandy valley floor. This is primarily a "fill-and-cover" site. Refuse is brought in by twelve Packmaster 12-yd. collector units and dumped on the valley floor. It is then spread and compacted with an International TD-14A with Drott bullclam shovel; following spreading and compacting, the tractor and clam borrow cover material from the valley sides and place an 8-inch cover over the refuse.

City owned trucks make two collections a week from the business districts; in the winter, when the population of the city is about 30,000, collections are made once a

(*Please turn to page* 142)

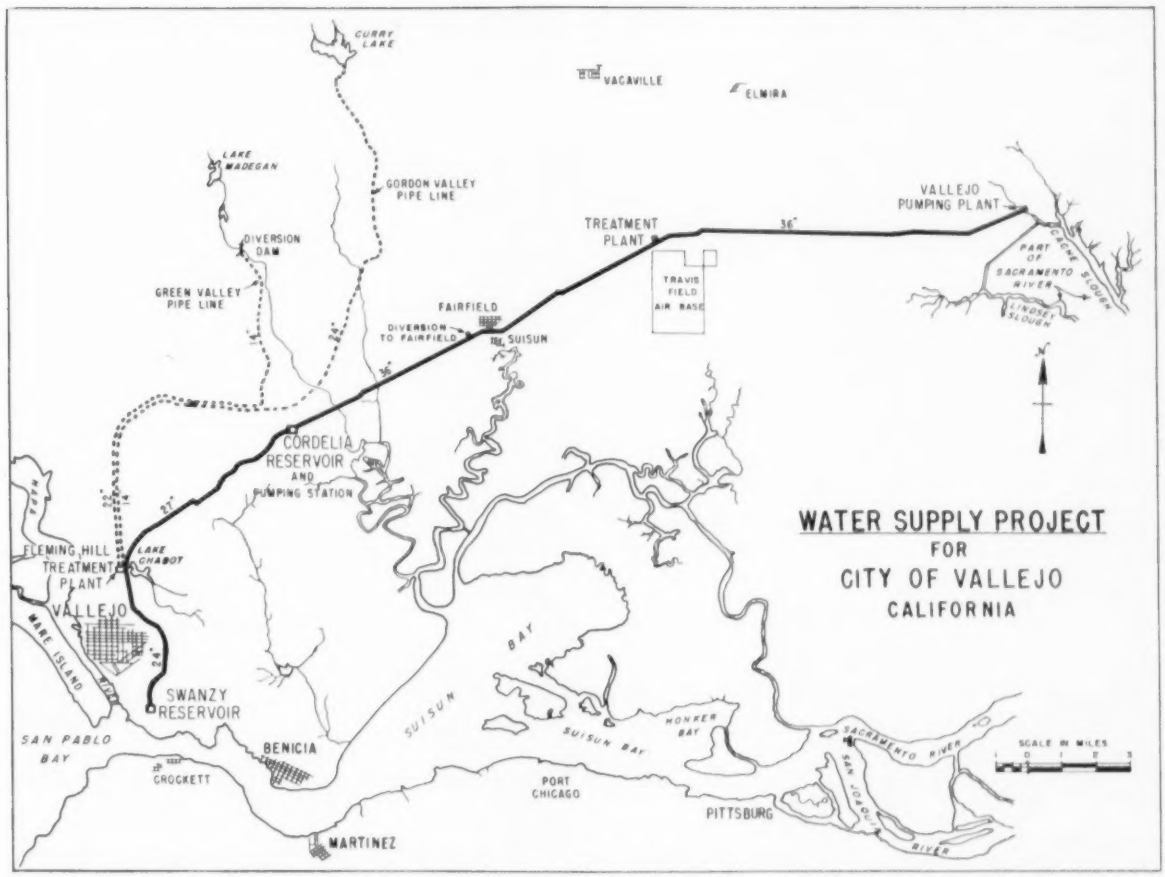
● **HANDLING a load of refuse that has just been dumped by a Leach Packmaster, an International tractor with Drott bullclam starts spreading and compacting.**

● **MAKING a new plant site for Michigan City, Ind., industries, the International tractor and Drott bullclam, also shown above, handle 2300 loads monthly.**

MODERN DESIGN FEATURES

NEW

VALLEJO WATER PROJECT



● **VALLEJO'S water project: Cache Slough at upper right; Travis Field is upper center; treatment plant is lower left.**

FINANCED with a bond issue of $6,100,000, Vallejo, Calif., is now completing a very modern filter plant and supply system, drawing 20 MGD from Cache Slough, a branch of the Sacramento River. Previously, the city had been supplied from four other sources—Lake Chabot, furnishing 0.5 mgd of water, hard and subject to surface pollution; Green Valley, with 1 mgd of excellent water; Lake Curry, furnishing 5 mgd; and the East Bay Municipal District, which supplied about 10 mgd.

H. L. THACKWELL

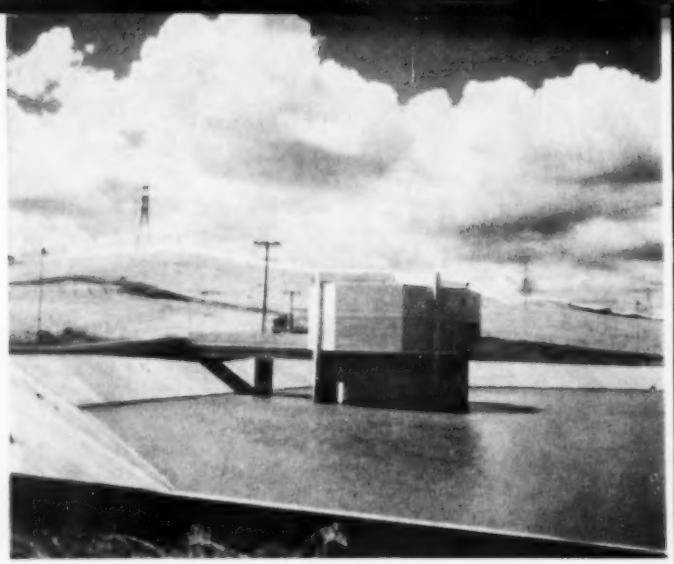
Kaiser Engineers, Oakland, Calif.

The total available for Vallejo is thus 26.5 mgd, of which about 19 mgd will be used within Vallejo township, including Mare Island Navy Yard, which uses about 40 percent of the total; the cities of Fairfield and Suisun and Travis Air Force Base will use not to exceed 6 mgd; and ranches, users along the water lines and the village of Cordelia may use 1.5 mgd. With a per capita use of 240 gpd, there will be sufficient water for a total population of 110,000, which is estimated for the year 1971.

The quality of the Cache Slough water is good, though during times of flash floods, turbidity may reach 1000 ppm. Normally, analyses show the following in ppm: Chlorides 21; sulphates 8; alkalinity 92; total dissolved solids 203; hardness 96; boron 0.35; fluoride 0.5; turbidity 70; and pH 7.6. The water flocculates well with alum.

The new project consists of the

● OPERATING gallery, Fleming Hill treatment plant, showing layout and some of the attractive coloring.



● PUMPING plant at Cordelia Reservoir. Tower shown is octagon. Details of this unit are on opposite page.

following: A pumping plant at Cache Slough having a capacity of 20 mgd; a pipeline 24 miles long to Cordelia Reservoir, with 36-inch and 30-inch reinforced concrete cylinder pipe; the Cordelia Reservoir, which is an open, concrete-lined basin having a capacity of 15 mg; a pumping station at the reservoir to deliver the water to the new treatment plant at the rate of 15 mgd; a 6.7-mile pipeline of 27-inch reinforced concrete pipe under a maximum pressure head of 410 ft.; a 4.5-mgd capacity filter plant for Travis Air Base; a 21-mgd filter plant for Vallejo, located at Fleming Hill; and a Trans-Vallejo 24-inch concrete pipeline 5 miles long to Swanzy Reservoir.

The Cache Slough Pumping Plant is a 3-floor structure housing the pumping units. There are two 20-in. pumps with a combined capacity of 20 mgd, driven by 600-hp motors, and one 16-inch 6-mgd pump with a 250-hp motor. The pumps operate automatically, governed by pressure controls; surges are reduced by a pneumatic surge tank and water hammer by pressure releasing valves which discharge water directly back into the slough and then slowly close. Starters are GE Limitamp 2300-v, panel construction. The control board has recording devices for the venturi meter, pressure, temperature and motor running time.

The upper or ground floor has a bridge entrance and a 10 by 10 ft. door so a truck may be driven into the building to deliver ton containers of chlorine, which are handled by a traveling crane to a separate chlorine room on the lower floor. This chlorine room is sealed with a trap door to prevent chlorine fumes from entering the pump room; it contains a 2-ton scale and space for three chlorine containers. The Wallace & Tiernan 400-lb. chlorinator is housed in a separate room with water and gas-proof doors and feeds through an Uscolite pipe to a perforated pipe manifold between the trash racks and pump suctions. An automatic heating device is provided to maintain a minimum temperature of 55° F. Chlorine feed is automatically cut off when the pumps stop. Chlorine demand of the raw water is usually 1 ppm, but an application of 2 ppm is required for disinfection and slime control. Water taken from the line prior to filtration is used for stock watering only.

The second floor contains the pump piping, surge chamber, pressure reducing valves for the control of water hammer, and an air compressor for surge tank filling. An automatic tide gage is provided which records the tidal flows occurring 3 times a day with a high to low variance of seven feet; there is also an aluminum boat which may be lowered through a hatch with an electric hoist for inspection of the pile fenders and for channel sounding purposes.

The pipe inside the building is flanged steel, having ½-in rubber gaskets. The pumps have base plates setting on ½-in of solid rubber which reduces vibration to a minimum. Air valves are provided in the line for elimination of air in starting up the pumps. The pumps may be started and stopped with pressure control devices which may be operated by a valve at Cordelia Reservoir 24 miles distant.

The lowest floor has access to the trash racks which are made of redwood, having 2-in. clear openings. This floor is surrounded on three sides with chain link fencing, the back side being of concrete. The trash racks are cleaned manually of tules which sometimes remain hanging in the racks, but normally the tide and current flow carries the debris away from the structure. Silt that may settle in the sump pit is sluiced out or agitated by a high pressure water jet on the bottom of the sump. Fish are kept out of the pump suction by a ¼-in. basket type strainer.

Pipeline to Cordelia Reservoir

This is a 36 and 30-in. line of prestressed concrete cylinder pipe made by the American Concrete Pipe Company. The joints utilize a rubber gasket; the inside of the joint was filled and pointed with cement mortar by a workman traveling inside the pipe on a dolly. The outside of the joint was filled with grout poured in the field. Pipe lengths were generally 33 ft. long. Manholes for inspection purposes were built in the line every half mile. Blow-offs are placed at all low points along the line. Air valves are 2-in. and are used for vacuum relief when emptying the line. A special slow closing, Pelton type air valve and water release valve is used at a critical point near a summit on the line.

Gate valves set in the line for control purposes are housed in concrete box type manholes. Railroad and highway crossings are protected with an outside steel casing through which the pipe was placed. A section of 30-in. line laid through a

salt marsh received an external coat of Bitumastic enamel and two coats of felt wrapper for protection against corrosion. After completion, the line was tested with pressures of 150 percent of operating water pressure. Leakage was approximately 25 gallons per inch of diameter per mile of pipe.

The hydraulic design assumed the coefficient "C" in Hazen and Williams formula as 145. The final result obtained was actually better with velocities of four feet per second through the pipe. Delivery to the city of Fairfield is made by a special metering device, having both a Venturi nozzle for the city of Vallejo and a Foster flow-tube for the city of Fairfield for double checking the flow.

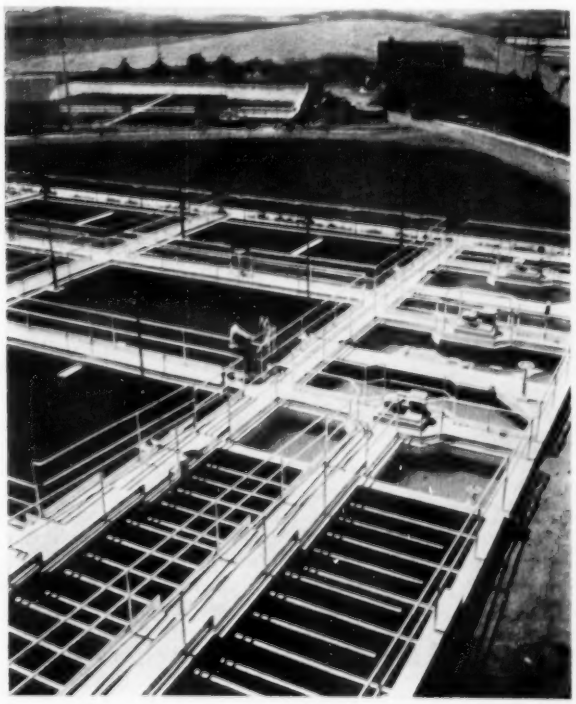
The Cordelia Reservoir

The Cordelia Reservoir serves to reduce pressures in the line, permitting a lower head and reducing the cost. It also serves to reduce power costs in that all major pumps at both plants are 600-HP. The two different demand meters reduce the power demand costs over that obtained by a higher horsepower demand meter. The reservoir will hold 15 MG or approximately a one-day supply for the city of Vallejo. If a break occurs in the line from Cache Slough, an immediate shut-down of the Vallejo filter plant is unnecessary. The reservoir also serves as a preliminary sedimentation basin removing 10 percent of the turbidity. A by-pass line for the Green Valley and Lake Curry supplies has been designed for future construction so that water from those reservoirs may be diverted to the Cordelia Reservoir and may also back flow to Fairfield and Travis Air Base. Also, should the Monticello Dam and Reservoir on Putah Creek be completed by the Bureau of Reclamation, that water would provide an additional source of supply.

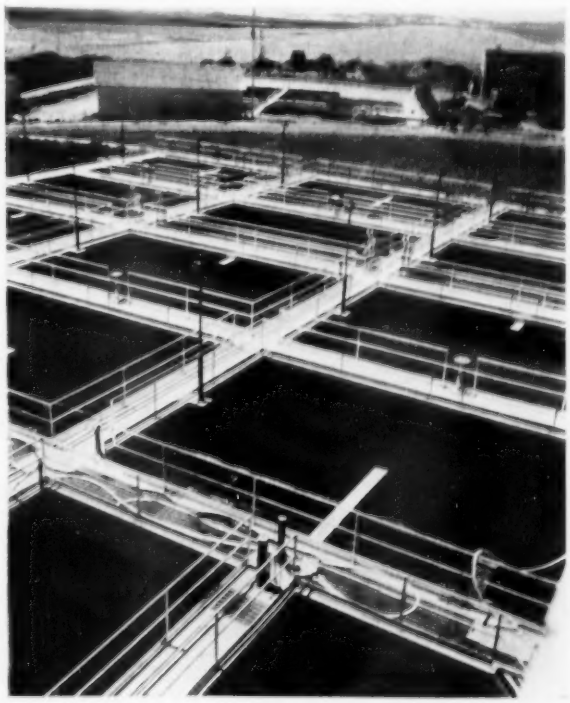
Cordelia Reservoir is octagon shaped, cut-and-fill type, with embankments 25 ft. high built of tight clay on a 1.5:1 slope. The inside floor and sidewall face is lined with four inches of concrete. The joints are filled with a special seal made of part rubber and asphalt. Under the joints, and around the pipe laid through the embankment, is a thin layer of bentonite clay. An asphalt paved driveway extends around the reservoir. A spillway, with concrete chute to a nearby stream, is provided for overflow purposes. An outlet drain to the creek permits sluicing out accumulated mud. The reservoir will require cleaning only once a year. The reservoir rim is provided with a rodent shield which is essentially an 18-in. high fence of 14-in. galvanized sheet steel, curved outward as a barrier to rodents, and also as a catch-all for windblown materials, such as sand, tumbleweeds and paper debris. It also acts as a curb for auto traffic around the basin.

The tower is octagon and houses two Byron Jackson turbine-type vertical 18-in. pumps, having 600-HP motors with Limitamp starters. These pumps are automatically controlled by pressure cells. If the main pipeline valve is closed at the Vallejo treatment plant, the back-pressure fills a surge tank on a hill a mile and a half from the plant. When that occurs the Cache Slough pumps are stopped. Opening the main pipeline starts the pumps again. A surge tank is provided in the tower building for reduction of water hammer, a pressure relief valve opening under water hammer or surge conditions and discharging water from the line back into the pump pit. Water flow is measured with a Builders Venturi recording meter. A stage register indicates water depth and low water control is provided by float switch.

Water enters the tower at mid height by means of two inward opening flap gates. The jets of flowing water from these gates impinge upon each other, thus destroying



● SLOW-MIX channels and flocculating basins at the Fleming Hill plant. These are described on page 91.



● SETTLING tanks at Fleming Hill plant provide 5.4 hours detention at 14 mgd. Design data are on page 92.

the energy of the falling water. This design made possible the considerable reduction of floor thickness inside the tower.

This plant is provided with a 10 x 10-ft. roll-up steel door so that a truck may be driven into the building. An overhead trolley with chain hoist provides a means for pulling the pump motors and dismantling machinery. There is only one window in the building and that is located on the side having the greatest water expanse and is protected with heavy grill. Forced ventilation is provided so that the heat from the motors may be dissipated during hot weather.

feet deep, with three feet of cover. Topography required a cut of 20 feet for a considerable distance, and a tunnel driven through a saddle in a mountain. At the center of the tunnel is a riser pipe to a surge tank on the saddle 75 feet above the tunnel. The tunnel is lined throughout with creosoted timbers and solid lagging. Drainage is provided to points outside of the portals which are barred with timber to prevent unauthorized access.

The velocities in this pipeline are over seven feet per second and yet the Hazens and Williams "C" is better than the 145 used in the design. The leakage in this line,

late the flow of alum from a dry feeder to the raw water. Alum dosage will be in proportion to flow, but at times of high turbidity changes, which will occur about six times a day due to tidal flow at high and low peaks, the proportional flow control will be dominated by turbidity control and adjusted by means of a cam to the required grains per gallon dosage. The filters also will be automatically washed and placed back in operation by means of loss-of-head gage settings or by time clock. It is contemplated that only a single operator will be employed for the day shift. The other 16 hours of opera-

● **TREATMENT plant at Fleming Hill is attractive, modern in design, and equipped with many automatic devices.**

A search light can illuminate any part of the water surface and an electric eye is arranged for automatically lighting up the reservoir as darkness approaches. A nonclimbable chainlink fence encloses the nine-acre tract. A permanent hard surfaced road connects the reservoir with the highway, which is ¼ mile distant.

The plant has no resident attendant, but is visited occasionally during the week for the purpose of checking the operation and maintenance of the equipment.

A 27-in. diameter concrete cylinder pipe carries the water to the Vallejo treatment plant at Fleming Hill. This line is laid about six

during the test period, was about 25 gallons per diameter inch per mile of pipe. No breaks have occurred in the line to date.

The Travis Air Base Treatment Plant

This plant is designed for an average flow of 3 MGD and a maximum flow of 4½ MGD. The raw water will be obtained from the Cache Slough source, with prechlorination at the pumping plant.

The plant is designed with many automatic features. The turbidity will be measured with an electric eye and continuously recorded; the recording device will have a potentiometer which will, in turn, regu-

tion will be entirely automatic. The chlorination of the water will be controlled by the pumps, chlorine flowing to the pump sumps only while they are in operation. Pumps will deliver water from the clear water basin to the surface reservoirs of the Air Base. It is proposed to control the water in these reservoirs to one foot of level. As the water is drawn down, the pumps in the clear well will deliver the water to storage and as the clear well water is drawn down, the influent regulator to the plant opens up and water starts flowing through the plant. When the clear well and reservoirs are full, the influent regulator closes and the plant shuts

down. This plant will be placed in operation about September 1, 1954. The units of treatment are as follows:

Flash mix occurs in five seconds in a hydraulic jump. Large quantities of air are mixed in the water, being released later during the beginning of the slow mix period. Alum will be introduced into the influent of the jump which is created by water falling over the surface of an ogee dam, the face of which contracts the water sheet gradually to the bottom of the dam, and then rapidly expands into a wider channel, the outlet of which is downward and then outward into the slow mix channels. These channels are 20 ins. wide and of the around-the-end type. Reverse turns at end of channels start counter clockwise eddys which, in the following bend, are changed to clockwise. The velocity for mean flow will be about one foot per second, with a retention time of 13 minutes. The water in these slow mix channels will have developed a pinpoint floc by the time it enters the two flocculation tanks which are set in series, with a normal retention time of 30 minutes. The stirring device is a vertical shaft revolving fixed redwood slats set vertically. The prime mover is a Thymotrol half-wave motor having a variation in speed change from 1 to 20. The motor drives the shaft through a speed reducer so that the resulting maximum peripheral velocity is 1.89 feet per second and the minimum is 0.09 feet per second. By this mechanism the average velocity imparted to the water mass will be one foot per second.

Water leaving the effluent of the last flocculating chambers will be projected downward from a collecting channel into two settling basins, entering first into a surge chamber, where a solid baffle extends one-half the depth across the entire width of the tank. This baffle will start the water flowing evenly in a horizontal direction in the lower half of the tank.

At 3 MGD average flow the time of retention is 3 hours, and overflow rate 430 gallons per sq. ft. per day. At the effluent, the water will be skimmed off by three rows of overflow weirs, each with double edges, easily adustable for raising and leveling. Three swing baffles at the end of the turn in the settling tank will guide the water into the reverse flow section without undue short circuiting.

There are four rapid sand filters, which will be operated at 2 gallons per square foot per minute at average flow rate, and at 3 gallons per square foot per minute at maximum rate. The filters will have Wheeler bottoms, over which will be 8 ins. of graded gravel; then 3 ins. of sand, .8 to 1.2 mm effective size, followed by 21 ins. of sand with an effective size of .50 mm, and a uniformity coefficient 1.30; the sand will be covered with 6 ins. of Anthrafilt #1, effective size .60-.80 mm, uniformity coefficient 1.75. The filter will have a Palmer surface wash and operating controls will be pneumatic to all valves and sluice gates. Instead of conventional operating tables, there will be a panel board containing all necessary recording instruments and showing a graphic outline of all control works. Electric controls will govern sequence timers and automatically control all devices for the automatic operation of the plant.

Omega dry feeders of loss-in-weight type will be used for dispensing alum, lime, and carbon. Chemicals will flow in open channels of stainless steel supported on a light steel trestle to the headworks, where the chemicals will be mixed. These channels can easily be cleaned of all incrustations of lime and alum without removal from the trestle. An elevator will hoist chemicals on pallets to the hopper floor of the chemical machines. Jacking dolly trucks will transport the chemicals on the floor to points of storage and usage. A chemical laboratory will be provided for the control of water treatment. Clear water may be taken from any filter effluent for analysis. The final effluent water will be chlorinated to the dosage required by the Air Force.

There is provided an operator's house; a workshop; and a garage with a single bedroom for an extra workman's use. An incinerator will be used for the disposal of paper sacks from the used chemicals. Grounds will be provided with water piping, sanitary sewers, roadways, storm sewers and lighting standards. Chainlink fencing will protect the plant against intruders during the absence of the operator.

The Vallejo Treatment Plant

The original Vallejo plant consisted of a single coagulating and settling tank of 4 MG capacity; the effluent from this tank was stored in a 10 MG open basin. The new plant utilizes the original settling tank remodeled with central baffle, hopper bottoms controlled with mud valves and pump, as a reclamation basin for wash water, which water, after settling, is pumped back through the plant for retreatment.

The old clear water basin was entirely changed by constructing a flat slab roof supported by numerous round columns. The clear water basin may be by-passed for cleaning and inspection purposes. In normal operation the water is stored in the basin and pumped to service through the pump tower well. Old damaged concrete in these tanks was removed and they were gunited for complete renovation.

The new plant is designed to treat any of four different waters, or any mixture of them. The raw water influent to the plant is controlled by motor operated ball-valves which are operated either automatically or manually, as the case may be. Water is measured by Venturi meter, as are all sources of raw water influents. The influent is split so that a proportional division of the raw water may be treated on each side of the plant. In this manner two different waters may be treated from the same chemical machines with different doses of chemicals.

The plant is symmetrical on each side of the pipe gallery. Each side has the following units:

A hydraulic jump is used for flash mixing and aeration, also for split treatment measurement; time of retention is 10 seconds. Slow mixing is in around-the-end baffled channels, with 10 minutes retention time and a mean velocity of one foot per second. Three flocculation tanks are set in series with Link-Belt vertical drive paddle units operated by thymotrol motors with variable speed control. Average rotational speed imparted to the water is one foot per second. Pinpoint floc obtained from the slow-mix channels is agglomerated in the first flocculation tank. In the second tank the floc particles become larger and denser, while in the third tank flocculation is complete, the particles being tough and dense, showing clear water between them. The retention time in the three units is 35 minutes. Water from these flows in an open channel to one end of three deep horizontal settling tanks. A surge chamber is formed in the first ten feet of each tank by means of a solid redwood baffle extending across the upper half of the tank. The flocculated water strikes the bottom of the tank and caroms upward, the floc forming mushroom heads in the baffle portion of the

channel; then the water moves slowly downward and laterally along the bottom of the tank. At mid-tank there is a movable baffle, operated from the surface, which is similar to Venetian blinds with horizontal redwood slats of 2″ x 14″ planks. These are arranged so that they can be opened or closed to any angle in either the upper or lower half, or in both. The effect of these baffles is to insure a more uniform velocity throughout the cross sectional area of the tank. This has proved quite effective, since mud deposits are much heavier just ahead of the baffle than in the last half of the tank. The effluent is passed over two rows of double weirs which skim the water with a ⅛″ nappe over the adjustable weir edges, and into a continuous filter influent channel. With an average flow of 14 MGD the retention will be 5.4 hours with a clean tank, and the overflow rate 600 gallons per sq. ft. per day. With 21 MGD flow retention is 3.6 hours, and overflow rate 900 gallons.

The tanks will require cleaning, due to mud deposits, when the time of retention has been reduced to 3 hours at 14 MGD and 2 hours at 21 MGD. Tanks may be cleaned at intervals from three to six months depending upon the turbidity.

A single tank may be cut out of service and cleaned by opening mud valves at the bottom of the hoppers. The operation requires only two hours of time. Mud is sluiced to four lagoons below the plant, which can be used alternately.

In actual operation these settling tanks have been removing approximately 96% of the turbidity with an economical dosage of alum. Normally the effluent onto the filters will have a turbidity under 4 ppm, with turbidities in the raw water of 60 to 150 ppm. Flash floods may cause turbidities of 900 to 1000 ppm, and under such conditions the alum dosages have to be very high. Prechlorination has been used for the control of algae growths. Activated carbon is employed in varying dosages for the removal of tastes and odors. Lime is used as a stabilizing agent to raise the pH for corrosion control.

There are three double filters on each side of the plant. These filters have Leopold bottoms, then 14 inches of standard graded gravel, on top of which is 27 inches of sand. The sand used is Monterey, having an effective size of 1.2 mm. The wash troughs are galvanized steel. Filters are connected in the pipe gallery to Builders controllers which are hydraulically operated from Builders tables. In washing the filters, a complete double filter is shut down, and one-half is back washed at a time. All filter washings are drained to the reclamation reservoir where, after settling, the water is returned for retreat ment. In backwashing the filters, water is pumped from the clear well and the pressure is brought by reducing valves to approximately 20 psi.

After filtration, the water, with an average turbidity of 0.2 ppm, drains to the 10-million gallon clear water basin. Final chlorination maintains a residual of approximately 1 ppm in the clear water basin.

Chlorine is delivered in ton containers which are stored in a scale room adjacent to the chlorinators. The scale automatically prints the remaining weight on a strip chart. Wallace and Tiernan chlorinators are used throughout and a W & T residual recorder is on trial for approval. There is a complete chemical laboratory and also a bacteriological laboratory. A continuous pH recorder is set in the end of the slow mixing channels. A shop is provided for maintenance purposes in the basement. An office is opposite the laboratory with easy access to the operating floor. A three-car garage is under the laboratory.

The office, laboratory, garage, shop, toilets and entrance stairway are located in the headhouse or entrance to the plant. This part of the structure is not joined rigidly to the rest of the plant; concrete skids are laid under the foundations so at some future date, if the plant is to be expanded, the structure may be jacked up and moved forward for the addition of four more settling tanks and eight more filters.

Control for the plant is largely automatic, and a room is provided for hydraulic recorders and for push-button electric control for the various pumps and motor operated valves. Domestic water is supplied to the plant by means of a 4-in. pump located at the clear water basin, which maintains a pressure of water not less than 65 psi and provides 120 GPM for this purpose. Raw water for hosing down settling tanks and for lawn irrigation is obtained from the Green Valley and Lake Curry sources. Venturi meters, control equipment, chemical feeders and recorders were furnished by Builders Pacific Company.

The plant is heated with natural gas by central and unit heaters. The grounds are provided with roadways, curbs and gutters, and storm drains. Power is furnished by the P. G. & E. Company. The plant is very compact and has a minimum of mechanical features with a resulting economy of operation.

The Trans-Vallejo Pipeline

This pipeline is a 24-in. concrete cylinder prestressed pipe connecting Fleming Hill Treatment Plant with the 35-million gallon Swanzy reservoir. This reservoir is 57 ft. higher than the top of the clear water basin at Fleming Hill and is located five miles to the south of town. The reservoir is open and is subject to some contamination, since the bottom is not paved with concrete though the side slopes are paved for ten feet in vertical depth. This Swanzy Reservoir water is again chlorinated when it is withdrawn from the reservoir into the distribution system. The principal purpose of this line is to maintain the pressure in the southern portion of the city, which has a large water demand.

The total annual cost for transporting water, after amortization of plant and operating and maintenance expenses, is one cent per 1000 gallons of water delivered. The total cost of water delivered from the Cache Slough source, and treated at Fleming Hill, including all amortization and operating and maintenance costs, is approximately ten cents per 1000 gallons as delivered into the distribution system.

The Vallejo waterworks system project was under the general direction of C. L. Wanger, City Manager, and T. D. Kilkenny, City Engineer. The design and supervision of construction was done by Kaiser Engineers of Oakland, California. The writer acted as design consultant throughout the project.

The pipelines and Fleming Hill water treatment plants were constructed by the Walsh Construction Company of San Francisco. The Cache Slough pumping plant was constructed by Fred J. Early Company of San Francisco. The Cordelia Reservoir was constructed by two contractors: Erickson, Phillips & Weisberg of Concord, California, had the concrete lining and pumping plants; the earthwork and road was constructed by E. E. Lowel of Vallejo.

The Travis Field water treating plant was constructed by the S & Q and Rayer Construction Company of San Francisco. The Trans-Vallejo pipeline was constructed by the Coast Pipeline and Wunderlith Construction Company.

ALUMINUM LIGHT STANDARDS ERECTED IN HEAVY TRAFFIC AREA

E. J. KNUDSEN

Mobile Illumination Recorder Speeds Light Intensity Survey

WISE planning and good usage of equipment enabled crews to install 39 new aluminum light standards along a 5-block stretch of Jackson Blvd. in downtown Chicago while traffic in excess of 4,000 cars per hour was in progress. The standards, which will carry 400-watt mercury-vapor lamps, are being installed over the entire 210-mile boulevard system by the Chicago Park District.

One piece of equipment that has proved valuable in the installations both for its accuracy and its time-saving features, is the Mobile Illumination Recorder. This rig consists of two photo-sensitive cells mounted in shields at each end of the rear bumper of a car. Situated 6 ins. above the pavement, the signal from the additive light between the cells is transmitted to an amplifier on the rear seat of the car which records the ft.-candles on a graph as the car proceeds at 15 mph. The recorder is connected by cable to the speedometer for continuous plotting of the lamp spans. With this equipment, supplied by the General Electric Co., it is possible for two men to measure light intensities over 30 mi of street in one evening, whereas under the old system of measuring light by laying out grids and establishing points it took two men an evening to cover 100 ft.

The problem of trenching over this 40-ft. wide one-way arterial boulevard while traffic was in progress was a difficult one. About 800 ft. of cross-lane laterals and about 300 ft. of longitudinal laterals were needed from the pole foundations to the transformer vaults. Where possible, foundations of the old poles were used. To permit traffic to use the street while the cross laterals were cut, one-half the street was cut through at a time. A temporary sand fill was then placed in the excavation for the traffic to pass over while the remaining half of the street was cut through.

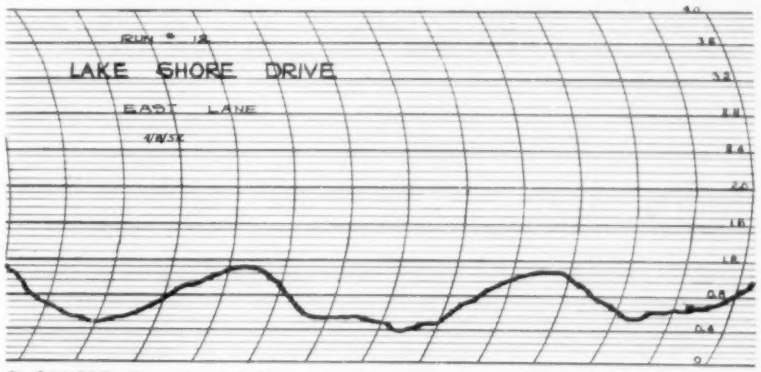
Trenching for the laterals was carried out by a crew of 14 equipped with Gardner-Denver B87 concrete breakers powered by a Chicago Pneumatic and a Worthington compressor. The trenches were opened to a depth of 17 ins. below the pavement base and were 14 ins. wide. Conduit used was 4-in. fiber and 2-in. galvanized iron tubing for the risers.

The aluminum standards, which were supplied by Pfaff and Kendall, are spaced from 65 to 115 ft. apart in a staggered arrangement; they take the places of 122 steel poles with incandescent lamps in clusters. The luminaire is placed 31 ft. high on an overhang of 8 ft. The EH 1 lamps installed on the new standard are rated at 20,000 lumens.

Erection of the poles was carried out by a crew of five equipped with a GM truck mounted with a Ho'an elevator platform. The installations were made along one side of the street at a time. The poles were lashed to the elevator platform by a sling, raised to their foundations and then bolted by stainless steel bolts. The crew erected about six poles per day.

The use of the aluminum standards have proved economical for the park district for several reasons: 1. First cost, which is about equal to those of other standards; 2. Cheaper to install; its weight is about 200 lbs., as against the 1600 lbs. of the average non-aluminum standard, requiring less labor for handling; 3. Low Maintenance cost.

In charge of the work for the Chicago Park District is F. D. Wyatt, electrical engineer, and William H. Miller, assistant engineer.



● SAMPLE of graph of lighting intensity made by mobile recorder shown below.

● MOBILE recorder gives continuous plot of lighting intensity as indicated by the graph just above.

Making Modern Living NORMAL *in the SNOW BELT*

ARTHUR W. TEWS,
City Engineer, Duluth, Minn.

Modern living is made normal in the snow belt of these northern United States with the use of the latest snow fighting machinery.

Duluth's streets are kept open and usable by the application of salt, sand and steel. Salt is applied to keep the snow workable; sand is applied to supply traction on our numerous grades of 10% or more; the steel is applied in the form of machinery, motor patrols, plows, trucks, loaders, sanders and salters.

Our snow season usually runs from October to April; and it was as late as May 15 in 1950.

Here are the figures on amount of snowfall, cost for control and salt and sand purchased for the past five years: In 1949, 56.8 in. of snowfall; cost of operations $149,400; salt purchased $2,608. In 1950, with 106.5 ins. of snowfall, removal cost $188,500; and $1,848 was spent for salt. For 1951, corresponding figures were 62.8 ins., $179,700 and $1,557; in 1952, 43.5 ins., $184,800 and $2,412, plus $4,198 for sand. Last year—1953—there were 67.8 ins. of snow, which cost $178,700 to remove, and we spent $3,106 for salt and $1,012 for sand.

Our policy has been sufficiently flexible to allow for hiring equipment when the need arises. We have rented trucks to be used for plowing in some instances, and again we have hired trucks to be used for hauling snow from one or more of our three rotary loading units. We have in the past hired motor graders for snow plowing and ice removal.

Over the years the Council has adopted ordinances which have modernized our habits to allow for better conditions for snow plowing and snow loading. The following laws have proved to be the most important:

1. On November 27, 1950, the Council passed the all important "One Side No-Parking" ordinance, No. 6844, which forbids parking on the even numbered side of our streets and avenues between November 1 and April 15. In Duluth the even numbered side of the streets and avenues are the lower, or south side of our streets, and the easterly or uphill side of the avenues. This ordinance applies to the residential areas only and requires no signs.

2. Ordinance No. 6845 was amended to restrict all parking between 1:30 a.m. to 6:30 a.m. and allows the Public Works Department to place "Snow Removal, No Parking" signs along the streets, providing signs are placed before 4 p.m. Section 37 of this ordinance gives the Public Works Department power to have all cars removed which are parking in violation.

3. Over the years there is an ever increasing number of narrow streets and avenues where parking is prohibited 24 hours the year around to allow for better and freer use of these narrow streets.

Because Duluth is one of the largest cities, areawise, in the United States, with an unusual number of miles of streets, our winter traffic problem is unusually difficult and costly. The elimination of all street cars and changeover to trolley and gas buses in 1939 brought additional burdens to the Public Works Department.

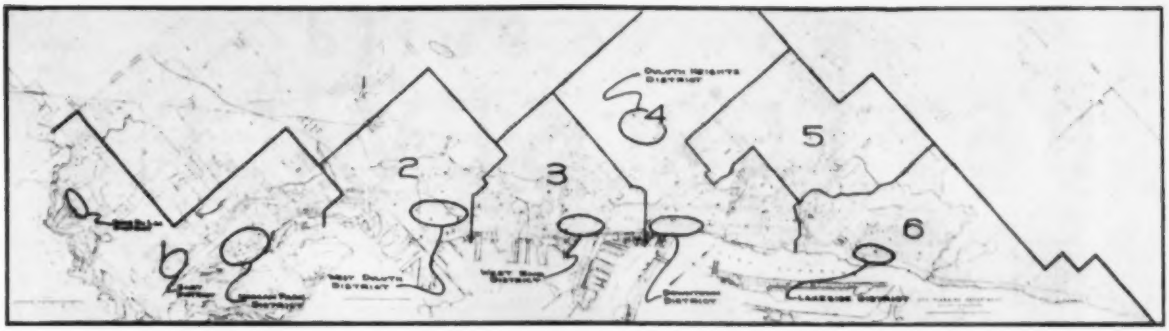
The customary plowing performed by the street cars was abandoned completely and the entire plowing job was thrown in the lap of the City. We are now charged with the plowing of 500 miles of streets, 150 miles of alleys and the inner 25 miles of trunk highways. The state maintains and plows the outer 25 miles of highways which lie within the city limits.

Plan of Procedure

A definite plan of procedure has been developed which follows along in a general way from year to year except for extraordinary snow falls or snow storms. When the snow starts falling during the night, the street railway night superintendent calls the Public Works foreman charged with snow removal opera-

● **LOADING** snow is big business in Duluth at times. Here a Model LTR Sno-Go is loading into trucks on a main street.

● **ALLEYS** are plowed, too. Here a V-plow is mounted in front of a Hough Loader. A definite program is followed.



● MAP OF the City of Duluth, showing unusual length, lack of breadth, environs and six maintenance districts.

tions. All snow plowing units are called out when the snowfall passes the 2-in. mark unless the storm is of blizzard proportions, causing poor visibility.

Our City is divided into six districts with a foreman in charge of each district working immediately under the Public Works Superintendent. Each district has a definite assignment of men and equipment which generally works on a definite plan of procedure. Each plowing unit follows a preplanned route. The most heavily traveled thoroughfares are opened first and then the lesser used routes. A shift in equipment from district to district is made to meet the needs.

Snow removal equipment includes: One #171 Rotary Sno-Go; two LTR Sno-Go units; two Model HM Hough loaders; one Caterpillar auto patrol; two Caterpillar diesel graders; one Caterpillar tractor and dozer; two Caterpillar tractors; two Austin-Western auto patrols; four Austin-Western Master 99 graders; one Allis-Chalmers tractor; one International tractor; one Industrial tractor, with Minneapolis-Moline Lull Shoveloader; one Dodge truck tractor; one LaCrosse semi-trailer; two semi-trailers (one Freuhauf); 25 trucks; 28 truck plows; eight tractor plows; 11 sand spreaders; and two salt spreaders.

On account of our numerous steep grades, we have, through experience, purchased all-wheel-drive motor graders. We also have many 4-wheel-drive trucks which are used for snow-plowing. Our small trucks have angle plows only and are used on the flatter streets and avenues. We have two large Hough loaders which are equipped with V-plows and are used generally on narrow alleys and streets which have steep grades and are poorly improved or just turnpiked. We have found these units very efficient and maneuverable. It is impossible to stick them in drifts or run them off roadways.

We try, in most cases, to complete the plowing of all roadways before pulling in the plowing units. This we find is very costly because of the overtime worked by the operators. When the budget begins to suffer and the funds run low, we plow during daytime hours only.

As soon as enough snow has accumulated to warrant loading out, we start our night snow removal crew. This unit usually starts at midnight and works until 8 A.M.

We find a greater demand each year for additional snow removal. The areas which have been cleared for the last five years seem to grow in size, requiring more blocks of streets to be cleared. We have three small Sno-Gos which we used for loading trucks and for general blowing purposes. We do not have enough trucks and manpower to work these three units at the same time. We are finding it more difficult each year to find sufficient dumping grounds where we can waste the snow that has to be loaded. It seems that the water front generally is becoming more developed, leaving less waste land for snow storing.

The daytime crew also works on the snow loading operation, usually on the outlying areas other than downtown. On account of our unusual topography and lakeshore ribbon platting we are confronted with many outlying business districts: Lakeside in the east, Duluth Heights on the hill to the north, the West End and West Duluth, Morgan Park, Gary, and Fond du lac. Each of the above named areas has an appropriate business district which needs immediate snow plowing and early snow loading and removal.

● BANKS of snow shown in this photograph taken on Livingston Ave. show how snow removal can be a definite problem. Careful planning speeds this big job.

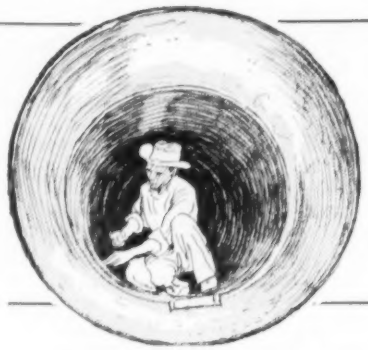
As spring approaches and the sun becomes hotter, a thawing and freezing cycle develops, which runs approximately 45 days. The sun thaws the ice and snow in the daytime and as the temperature falls after sundown freezing sets in. This condition raises havoc with our permanent surfaces when allowed to continue day after day. To combat this moisture and freezing condition we are employing three safeguards. We are building a maximum crown in our new streets and surfaces. We continue to plow snow and ice and load this out on the high side of our streets. We uncover the catch basins on the avenues and steam out all frozen storm sewer pipes. By applying these safeguards we reduce the wear and tear which takes place on our streets during the spring.

How to Build BETTER SEWERS

ROBERT G. SCOTT

Vice President and General Mgr.,

Clay Products Ass'n.



Sanitary sewers, like all other permanent structures, deserve careful design, good workmanship and quality construction materials. As a guide to engineers responsible for the final results of such construction here are a few of the major factors affecting the serviceability and life of sanitary and storm sewers. Attention to these details during construction may mean the difference between long, trouble-free service or an outright failure of the sewer.

BEFORE design begins, investigate all field conditions thoroughly. The kind and weight of soil, height of ground water table, probable depth of backfill, quality of bedding and the amount and type of super-loads which may be imposed on trenches should be known. In the case of preliminary investigations, anticipate as nearly as possible the character of the foundation which may be expected. The necessity of sheeting and bracing should also be considered. Some engineers, in their advance investigations, set a definite limit on the trench width which may be excavated.

Engineering manuals thoroughly cover all the ramifications of design, so only an outline of the various design steps necessary to obtain proper sewer installation will be mentioned here. The engineer should design for maximum carrying capacity with the most feasible routing conditions. He should obtain the maximum strength from pipe by (a) holding trench width to a minimum compatible with good laying and jointing techniques, (b) providing a good foundation for the pipe, (c) laying and jointing pipe for the best alinement and slope, (d) preventing excessive infiltration and (e) backfilling properly. To insure uninterrupted permanent service of the completed sewer line, the pipe materials should have adequate strength, high carrying capacity, thorough resistance to chemical or biochemical attack and infiltration-proof joints.

Strength Considerations

Structural stability is one of the essentials of good workmanship. Many design engineers think of a sewer pipe from the hydraulic standpoint only and neglect its importance as a structural element. In practice, each length of pipe installed in a sewer is as much a structural member as a column, a beam or a girder. It is of major importance that trench width be controlled during excavation. It should not exceed the width used as the basis for loading computations. Two factors make narrow trenches advisable. First, when trenches are held to a width not exceeding the outside diameter of the pipe socket, plus 12 inches, some lateral support is given to the pipe.

The second reason for holding trench widths to a minimum is even more important. To understand this point remember that there is considerable friction in soil movement. The amount of friction depends primarily upon the type of soil or material used for backfilling. In a trench backfill this friction is created between each soil particle and between the backfill and the walls of the trench. When a trench is backfilled, the depth of the backfill is greater on each side of the pipe than directly over it. Because of this, there is greater settlement of the backfill on each side of the pipe than immediately over it. This downward movement of the backfill on each side of the pipe actually increases the load on the pipe by pulling down (through friction) on the backfill material over the pipe.

Because the trench walls are of undisturbed earth they do not settle or compact. Through friction they have a tendency to support the backfill adjacent to them. When the distance between the pipe and the walls of the trench is held to a minimum this friction lessens the downward pull of the backfill and thereby reduces the load on the pipe. Conversely, as the distance between the pipe and the trench walls increases, the load on the pipe increases. Trench width is only important as a design factor for the distance from the floor of trench to the top of pipe.

Trench Excavation

Some soils lend themselves more readily to narrower trenching operations than others. The walls of ditches cut in stiff clay or loam may stand upright with little or no lateral bracing, and minimum trench widths are easily obtained. In some slightly less stable soils it is possible to slope the walls of the trench and then shape the bottom section in such a way as to provide vertical walls and minimum width up to a point level with the top of the pipe.

Where excavation is made in completely unstable ground which tends to crumble and cave, sheeting and bracing should be employed, not only to protect the lives of workmen but to reduce the necessary trench width at least to the top of the pipe.

One of the most difficult prob-

lems which must be overcome in sewer excavation is the removal of ground water which percolates or finds its way into the trench. Where the amount of water is slight, it may be directed into small sump pits and pumped out of the trench. Larger quantities may require almost continuous use of pumps. In some instances, construction underdrains of open joint pipe may have to be put in paralleling the sewer pipe to lead troublesome ground water to pump wells or a gravity outlet.

In cases where sewers are laid in quicksand or below the water table, it may become necessary to dewater the trench below the subgrade by means of a series of well points. A dry trench is necessary to good construction and care should be taken to provide such conditions.

Pipe Foundations

The supporting strength of pipe is dependent upon the manner in which it is placed on the trench bottom. Pipe laid without care will not develop its full strength. When laid according to ASTM specifications, the bottom quadrant of the pipe should be fully and uniformly supported. Holes for the bells should be dug at proper intervals so that no part of the weight on the pipe is supported by the bells. All tables and calculations for supporting strength are based on the entire load being supported uniformly by the full length of the barrel of the pipe. By providing supplementary foundations, such as cradles or encasements, pipe strength can be further increased.

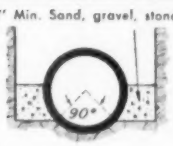
Supplementary Foundations: Where the floor of the trench is not sufficiently stable or firm to prevent vertical or lateral movement of the pipe after installation, good engineering practice calls for supplementary foundations. These are of many types, varying according to the requirements of the specific job.

The simplest supplementary foundation is a layer of broken stone, sand, cinders or gravel used on the floor of the trench as a stabilizer. The next simplest is placement of a concrete cradle. In extreme cases, it may be necessary to encase the pipe in a concrete jacket or to install continuous timber or masonry bridging, supported upon a pile foundation.

Pipe laid in rock trenches usually requires a cushion to provide uniform support for the bearing surface of the pipe. Probably the most satisfactory foundation in such cases is to place a four-inch layer of sand or small broken stone or gravel under the pipe. This cushion should be shaped to support the bottom quadrant of the pipe.

Table I shows the percentage of the normal supporting strength pipe obtained with various types of bedding.

Where the pipe is bedded with its bottom quadrant uniformly supported, it can be considered to have the supporting strength of ASTM pipe, when tested by the sand bearing method. When the pipe is bedded in four inches or more of sand, crushed rock or gravel, its supporting strength is increased by 30 percent over the strength measured by the sand bearing tests. When the pipe is imbedded in a continuous concrete cradle, which provides an unyielding uniform support for the lower quadrant of the pipe barrel, the supporting strength of the pipe is normally increased by 60 percent over the ASTM sand bearing method of computation. When the pipe is com-

PIPE SIZE IN INCHES	 Fig. 1 Ordinary bedding		 Fig. 2 Tamped backfill		 Fig. 3 Improved bedding		 Fig. 4 Concrete cradle	
	100% Supporting strength		115% Supporting strength		130% Supporting strength		160% Supporting strength	
	SAFE SUPPORTING STRENGTH IN POUNDS PER LINEAL FOOT							
	Standard Strength	Extra Strength	Standard Strength	Extra Strength	Standard Strength	Extra Strength	Standard Strength	Extra Strength
6	1430	2850	1645	3275	1860	3700	2290	4560
8	1430	2850	1645	3275	1860	3700	2290	4560
10	1570	2850	1804	3275	2040	3700	2515	4560
12	1710	3200	1965	3680	2225	4160	2735	5120
15	2000	3925	2300	4515	2600	5100	3200	6280
18	2430	4700	2795	5405	3160	6110	3890	7520
21	2860	5500	3290	6325	3720	7150	4575	8800
24	3430	6300	3945	7245	4460	8190	5490	10080
27	3930		4520		5110		6290	
30	4570	7100	5255	8165	5940	9230	7310	11360
36	5570	8575	6405	9860	7240	11145	8910	13725

● **TABLE 1. This shows the safe supporting strength of clay pipe with various types of bedding. Not shown is the safe strength with concrete encasement, which is much greater. Good bedding is essential for all sizes and on all jobs.**

pletely encased in concrete masonry, the supporting strength of the pipe can be considered to equal the sum of the required strength when tested by the sand bearing method, plus the computed supporting strength of the encasement.

These percentages are from the ASTM "Recommended Practice for Installing Clay Sewer Pipe (C-12)".

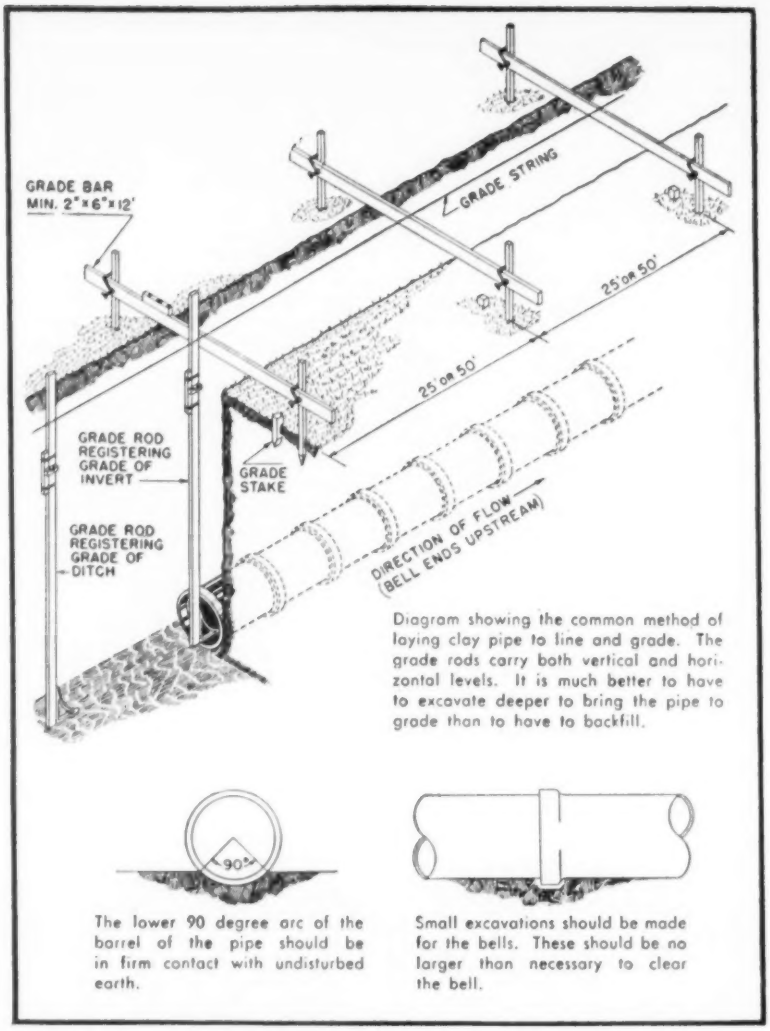
Pipe Laying

Adapting design requirements to the specific field conditions is the responsibility of the field engineer. It is recommended that he inspect soil samples from the trench and load computations made during design prior to laying the pipe. The character of the soil actually found in the excavation may vary greatly from what was anticipated by the designer. By the same token, unauthorized trench widening or impermissible pipe foundation must be averted to prevent loads in excess of those determined by the designer.

Actual staking out of sewer lines is elemental, but a sketch of one of the common methods of laying pipe to line and grade is shown in Figure 1. Each section of the pipe line should be laid to the specified line and grade. The trench bottom should be firm and dry. Each spigot end should be centered in the bell to form a close concentric joint and to provide unbroken continuity of the invert. All pipe should be laid with the bell ends up grade with the spigot end pointing in the direction of flow.

As each length is laid the interior of the sewer should be cleared of all dirt, loose hemp, jute, jointing compound or other matter. For smaller sewers, where cleaning after laying may be difficult, a swab should be kept in the pipe line and be pulled forward past each joint after it has been completed.

Cracked or broken pipe should be replaced and as each "Y" or "T" branch connection for service lines is installed, a stopper should be inserted and cemented into place to prevent dirt or ground water from entering the pipe main. The location of each branch for service lines should be marked and a record should be kept indicating its distance from the nearest downstream manhole and the side of the street toward which the branch points. In cases where the sewer is deep and service connections must be made by means of a riser pipe, the backfilling should be carefully made to eliminate the possibility of breakage or displacement of the riser. Where deep trenches are encountered and the height of the riser to be constructed is great, the "Y" or "T" branch into which the riser fits should be encased in concrete.



● **FIG. 1. This shows good practice in laying sewers to line and grade. Note the placement of the pipe, lower left, and the bell holes, lower right.**

Pipe Jointing

Two general types of jointing materials for sewers are in use today: the adhesion joint and the compression joint. Among the adhesion type joints on the market are the hot-pour compounds and the mastic cold applied compounds. Some of the more common compression joints in use are the die-cast joint and the tubular rubber joint. The essentials of either type of joint are: 1. It must be easily assembled or placed; 2. it must be water-tight; 3. it must remain tight even under deflection; 4. it must resist the attack of corrosive wastes and gases found in sewers; 5. it must be of tested root-proof construction; and 6. it must be economical and easy to make.

Several jointing materials are now available to meet these conditions. But, to be effective, they require conscientious workmanship. Engineers and constructors who are not sure of the best type of joint for a specific installation can obtain complete information from pipe manufacturers or their trade associations.

Infiltration Requirements

The prime causes of infiltration are poorly made joints, defective manhole masonry, etc. Where there are large quantities of ground water in the soils surrounding sewer pipe and sewer manholes, good workmanship and jointing materials are especially important.

Unfavorable soil conditions influence infiltration in various ways. For example: In the cases of uniform and pervious soils such as fine gravel or sand, water passes through them quickly, coming in contact with the sewer system and causing intermittent infiltration. In

the case of uniform and impervious soils, such as clay or clayey loam, water does not pass through easily and the system receives little, if any, percolating ground water. In extreme conditions, where a pervious soil exists above the sewer line and an impervious layer below, water passes through the upper stratum and completely surrounds the pipe. Careful preparation of the sewer trench, the use of proved jointing methods, close inspection, and insistence upon pipe and manhole materials which meet good specifications, will do much to prevent infiltration and exfiltration.

Final tests for infiltration allowances in new sewers are practical. In the case of large sewers the engineer and inspector may walk through the line examining the physical condition of the pipe, noting cracks, abrasions, leaks, etc. This usually suffices for an actual test of the line for infiltration and loss. In smaller lines a test may be made on sections to which house service lines have not yet been connected. These tests may be placing a bulkhead at the upper end of the section to be tested and a measuring device, such as a V-type weir or a plug with a drain into a receptacle which can be gauged at the lower end. Infiltration requirements vary greatly throughout the country. In general the specifications state that the rate of infiltration per inch of diameter per mile of pipe per 24 hours will not exceed a specified number of gallons. The A.S.T.M. Recommended Practices for Installing Clay Pipe (C-12) states that "Joints shall be made tight so that infiltration will not in any case exceed 1,500 gallons . . .".

Backfilling of Trenches

The natural excavated earth is usually satisfactory for backfilling purposes. To avoid shifting of the pipe and damage to the joints, the trench should be backfilled as soon as inspection of the pipe is completed. Thorough tamping is good engineering practice. It prevents lateral displacement of the pipe and assures uniform distribution of the loads on the pipe.

Best results are obtained by placing coarse screened backfill in successive layers of not more than six inches each. Each layer should be carefully tamped by means of a mechanical tamper, a 2 x 4, a paving iron or similar tool, before the next layer is placed in the trench.

Backfill should be placed under the haunches of the pipe with care and thoroughness to avoid vertical displacement. Selected material should be used for backfill up to a level of two feet over the top of the pipe. The remainder of the backfill should be reasonably uniform, free from frozen material, and should be placed so that no unbalanced loadings occur.

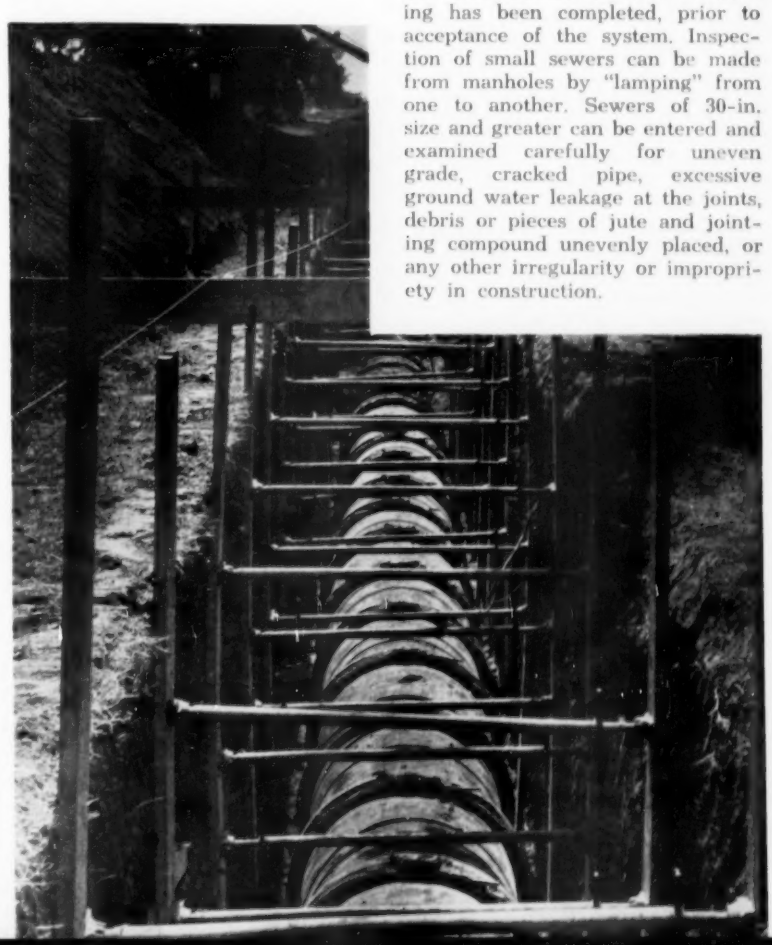
Where the excavation is in loose, uneven material, tamping may be necessary for the full depth of the trench to prevent excessive subsequent compaction and settlement. However, wet tamping and trench flooding for consolidating the backfill cannot be recommended as effective or advantageous. Tamping of the backfill does not add to the supporting strength of the pipe except as it may tend to keep the pipe line from shifting. The only exception to this is where the pipe is laid in very narrow trenches where clearances between the pipe and sidewalls of the trench are three inches or less. (See Table I.)

Good practice recommends that no sheeting be removed below the level of the top of the pipe. Whenever sheeting is removed from a trench after backfilling has been completed, a space is created at the sides of the trench. This space simultaneously robs the pipe of its lateral support and causes slips of the backfill which create additional loads, especially in water bearing soils. If it is desired to reclaim part of it, the sheeting should not be cut off at a point below four feet over the top of the pipe.

Final Inspection

Before any system is accepted, a final inspection should be carried out. The location and dimension of manholes, drop-inlets, etc., should be checked. Every manhole frame and cover, as well as all inlet gratings, should be at proper grade and solidly set in place. It is well to check for ground water leakage at the point where the sewer pipe passes through the manhole wall and to be certain that the invert channel in the manhole is smooth, with a uniform grade and proper elevation, as well as being of specified width.

Even though the sewer has been inspected as the line is laid, it is well to make another last check of the lines themselves after backfilling has been completed, prior to acceptance of the system. Inspection of small sewers can be made from manholes by "lamping" from one to another. Sewers of 30-in. size and greater can be entered and examined carefully for uneven grade, cracked pipe, excessive ground water leakage at the joints, debris or pieces of jute and jointing compound unevenly placed, or any other irregularity or impropriety in construction.



● **GOOD job of laying a 36-inch vitrified clay sewer. Note sheeting.**

Metropolitan Brookline

MUNICIPAL

WALTER A. DEVINE Town Engineer and Superintendent of Streets, Brookline, Mass.

TO provide facilities for waste disposal which would equal the high standards prevailing in other municipal functions of Brookline, Mass., a modern, well constructed incinerator was built and put into operation early in 1952. This plant is evidence of the desire on the part of the town officials to meet the highest standards of sanitation which engineers and technicians can offer.

Located in a high-class residential neighborhood, it was essential that all operations be conducted within the building to avoid criticism from offensive conditions of handling and disposing of refuse. The Brookline incinerator building is of first-class construction, with strict attention being given to provisions for the safety of employees and with two enclosed means of egress provided from each working space in case of fire. It is of fireproof construction, and a sprinkler system was installed as an additional fire prevention measure. The

● **APWA members, at recent meeting of local chapter, watch the 2-yd. bucket taking refuse from the pit to feed the two Nichols furnaces.**

sprinkler system is connected to the fire alarm system so that if a fire occurs, an alarm is given immediately. The building is also equipped with a burglary alarm system. Fog producing nozzles have been installed for the reduction of dust from refuse vehicles when dumping into the storage bins.

The frame is of reinforced concrete up to the level of the charging or upper floor, above which it is of structural steel, protected by fireproofing materials. The exterior superstructure walls are of solid brick, except where simple glass panels are used. Storage bin walls are of reinforced concrete. The entire plant appears as a building constructed of moderately priced brick.

All floors are constructed of reinforced concrete with suitable granolithic treatment, except in the case of the office, locker, lunch and toilet rooms, where asphalt tile is used. Interior walls in the working spaces are of moderately priced brick.

The architectural treatment is simple, plain, and functional. The exterior of the building, we believe, is attractive, due to the dignity of its proportions and the use of contemporary materials of moderate cost.

Vehicle Weighing

Refuse vehicles are weighed at the entrance to the plant and then drive over the dumping floor and

● **WOODHOG house contains chute and grinder where diseased tree trunks are reduced to chips before mixing with other refuse and burning.**

discharge their contents into the receiving bin, leaving the building immediately thereafter. Provision is made on the dumping floor for a truck laundry in order that all refuse collection vehicles may be washed daily in the building.

An overhead grab-bucket electric crane lifts the refuse from the receiving bin and drops it into a hopper over each furnace, through which it falls by gravity onto the grate within the furnace. The cab for the electric crane has an air conditioner for the comfort and health protection of the operator. After burning the refuse in the automatically stoked furnace, the residual ashes are discharged into the ash pits below through dumping sections of grates. The ashes are then discharged through an enclosed chute onto a traveling conveyor operating under water to assure that all clinkers are completely quenched before leaving the building. The flight conveyor deposits the ashes in a motor truck for final disposition as fill in an adjacent swamp area.

A mechanical oil burner has been installed in each furnace for use only on those rare occasions when heavy rainfall may cause the refuse to be excessively wet. With such provision there should never be any time when the temperature of combustion cannot be maintained easily at the desired high deodorizing point.

Ventilation Provisions

Provision is made for operating the plant with nearly all doors and windows closed and for ventilating all working spaces, but all air is discharged through the fires to insure complete deodorization. Provision is made for preheating the air before passing it through the grates, and the gases of combustion pass through large combustion chambers where the time of passage is sufficient to provide complete combustion and deodorization. The gases then leave the plant through a tall chimney.

requires high standards of performance for

WASTE COLLECTION and DISPOSAL

A woodhog house has been constructed as part of and adjoining the incinerator building where trunks of diseased Elm trees, which have been removed, are chewed up by a woodhog and delivered by a conveyor to the incinerator bin to be burned.

While no features of this plant are experimental, every provision has been made for thoroughly good operation.

The life of such a plant, with good care and maintenance, will be many years. The life of the building should easily exceed 50 years. The furnace linings gradually burn out and are replaced as a matter of routine maintenance. By such maintenance of all of the mechanical features, the entire plant should still give thoroughly good service at its full rated capacity for an indefinite number of years.

The all-purpose plant described above has a capacity or burning 300 tons of refuse in 24 hours, or 100 tons in a single shift of 8 hours, in its two furnaces.

Regulations for Refuse Collection

At the time the incinerator was put into operation, regulations regarding storage of various classes of refuse at the homes were established by the Health Department.

These regulations provided for three-part separation: (1) garbage, (2) burnable rubbish and (3) nonburnable rubbish. It was thought that this separation would be suitable for the method of disposal by incineration. Such, however, has not been the case.

Three-part separation has resulted in difficulties in the operation of the incinerator, and it has been instrumental in making the service more costly than would obtain were garbage and combustible rubbish stored in the same container and collected at the same time. It has been proven that two-part separation: (1) combining of garbage and burnable rubbish and (2) nonburnable rubbish, is more economical and results in more efficient operation of the incinerator. By combining garbage and combustibles and disposal of them in one burning, Brookline will save approximately $75,000 per year. This will cover the cost of operation and amortization of the incinerator.

The plant is operated by a foreman with a crane operator, three stokers, a mechanic, a motor vehicle operator and three laborers.

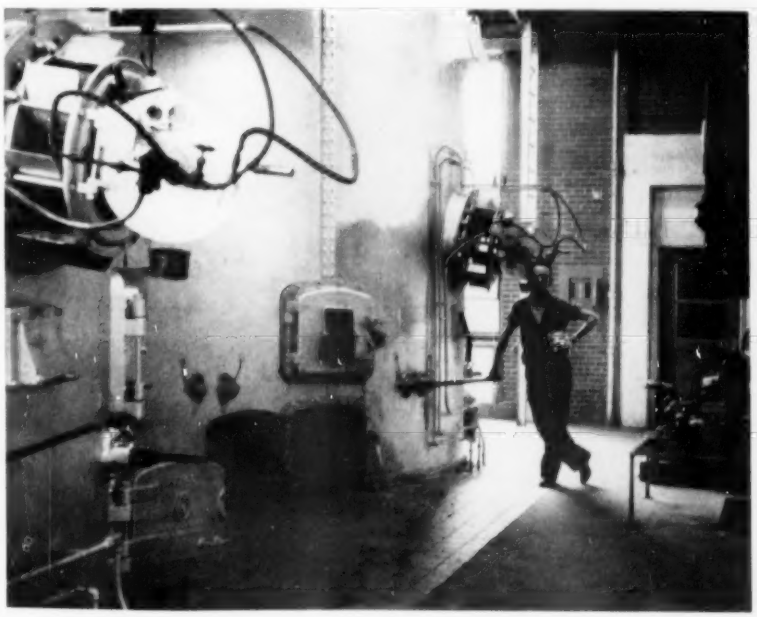
The cost of operation of the incinerator for 1953 was $38,680. With the possible addition of one laborer to the operating personnel, it is expected that the average annual operating cost will be approximately $41,380.

The collection equipment for combustibles, including garbage, consists of twelve 20-yd. capacity packer-body trucks. This type of equipment is efficiently operated with a driver and two laborers. The enclosed bodies are sanitary and eliminate the spillage of waste materials on the streets of the town. The average haul is approximately two and one-half miles. Two collections weekly are made.

The experience of the year and one-half that the incinerator has been in operation clearly shows its value in keeping Brookline in the forefront with refuse disposal services to the town's inhabitants.

The designer of the building was given the Award of Merit at the recent convention of the American Institute of Architects.

What was originally called the "dump," as the result of the building of the incinerator, is now known as "Incinerator Park" due to the improvement in the appearance and sanitation of the fill. It has been proven to the town that rules and regulations for collections, with good enforcement; properly designed collection routes; sanitary land fill; proper equipment and incineration must be correlated, one with the other, to effect the proper efficiency and economy in the collection and disposal of municipal refuse.



● **MECHANICAL stoking takes lots of the hard work out of operation. Plant attendants have time to keep plant interior neat and attractive.**

PAVING

a Key Element

in Subdivision Regulation

J. L. MORRISON

UNC School of Journalism,

Chapel Hill, N. C.

ONE mile of unpaved street maintenance per thousand population: That was the melancholy fact facing city officials of Raleigh, N. C., who compared 1950 census figures with their 65 miles of dirt streets. What Raleigh has done since, however, has been to make street paving a key element in its subdivision regulations. These regulations, widely regarded as among the most progressive in the Southeast, are helping Raleigh close the gap as regards unpaved streets. Moreover, the regulations are doing yeoman service in providing for orderly annexation of responsibly built and soundly financed subdivisions.

The key to the code, according to City Planning Director H. W. Stevens, is Raleigh's bargaining power through its control of water and sewage treatment services. Some cities, he acknowledges, have fewer services to offer but most have as many as Raleigh, or more. An insistence on street paving as an unconditional qualification for all subdivisions—and Raleigh has statutory authority to zone and control for a one-mile radius beyond its corporate limits—is seen as Raleigh's chief reliance for a substantial cutback in dirt street maintenance.

In recent years, Mr. Stevens adds, the development of subdivisions marked by shopping centers is another factor making for readier adoption of subdivision regulations. These subdivisions—Raleigh has a typical one in its giant Cameron Village—are marked by the developer retaining control over such ventures, leasing apartments and stores instead of selling them speculatively and then moving on. As a result, the adjoining city's very real assets of fire and police protection are inducement enough to the developer in complying with the strictest subdivision regulations.

Raleigh has developed a special procedure for agreeing with the developer *in advance*—and upon fulfillment of conditions by both sides—to annex certain subdivisions. Two such projects are under way at the present time, the Ridgewood development in West Raleigh by the creator of Cameron Village, and the Lakewood project near the new Westinghouse light meter plant. In both cases, annexation has been agreed upon and the city later will be able to incorporate fully developed tracts of the most desirable residential kind within its limits.

The one big concession the City of Raleigh has found it wise to make is to give such developers the benefit of the sewer service connection policy applicable to property *within the city limits*. In this case, a $100-per-connection fee will not have to be borne by the developer except if he reneges on his commitment to complete the project. The city requires him to make the $100 deposit for each contemplated unit, but the money is refundable as units are completed.

For the city's part—in connection with these to-be-annexed subdivisions—the city participates in the cost of installing water mains over eight inches in size when oversized mains are installed at the city's request. The developer is required to pay the entire cost of installation of water mains up to and incluing eight inches in size and for greater sizes when the area proposed to be annexed requires greater sizes.

As regards street improvements for these to-be-annexed subdivisions, the cost of these is shared in by both developer and city in accordance with the city's paving policy for street improvements *within the corporate limits*.

A street classification system is the core of this paving policy and has been found most useful, according to Mr. Stevens. Raleigh's streets, other than State highways, are classified as (1) principal thoroughfares, and (2) other streets.

Principal thoroughfares and their widths, from back of curbs, are:

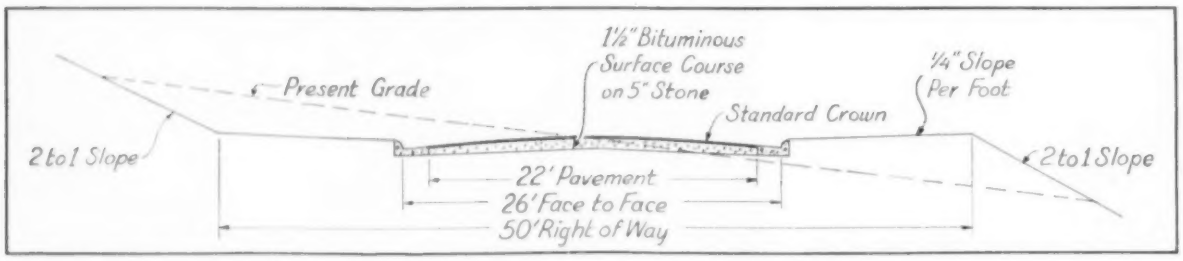
a. Major arteries 45 ft or more
b. Minor arteries 39 ft.
c. Collector streets 35 ft.

Other streets, and their widths, are:

a. Commercial streets 43 ft.
b. Residential streets 27 ft.

Apportionment of the cost of street improvements also forms a key part of Raleigh's subdivision

(*Continued on page* 156)



● DIAGRAM to provide guide of street cross-section is furnished by City Planning Dept. to subdivision engineer.

● J. ALLEM HAMMES, Office Manager of the Sheboygan Board of Water Comm'rs. shown at his desk.

Planned *Meter Maintenance* cuts STOPPAGES

D. M. CAREW

CLOSE adherence to a planned maintenance program, with periodic removal of water meters for testing and repairing, holds down stopped meters to about 90 a year in Sheboygan, Wis., a 100 percent metered community with 11,200 meters now in use. The total number of meters stopped for ordinary repairs was 1559 over the 17 years from 1937 through 1954, or an average of about 90. The annual total has ranged from 42 in 1951 to 98 in 1953. Such a striking record, of course, means that the amount of revenue lost to the city through "dead" meters and through under-registration by meters which are not up to par, is being kept at a minimum.

Periodic testing and maintenance of adequate records are the basic features of the city's program, according to J. Allan Hammes, office manager of the Sheboygan Board of Water Commissioners. Mr. Hammes said the meters are removed and tested by the utility once every seven years and reconditioned if necessary.

All meter repairing is done by the utility. When damage is due to ordinary wear, the cost is absorbed by the utility—but in the case of damage by frost or hot water or other cases of owner negligence the owner is charged for the repair. The utility does make a free repair, however, for the first instance of damage by frost or hot water in any meter.

For the 17½ year period July 1, 1936 to December 31, 1953 there were 1576 meters repaired which were damaged by hot water and by freezing, of which 605 were by hot water and 971 by freezing. The number of frozen meters per year varies depending on the cold weather. For example, the past winter was an open winter and only 25 meters froze. Other winters as in 1942, there were 93; in 1943 89; in 1945 71; in 1948 100; and in 1951 93. The number of meters per year damaged by hot water ranges from 29 to 52.

Results of the Program

In the meter testing program, about 1200 meters are tested per year. Over the 17½ year period the total meters tested aggregated 19,797. Of that number 18,583 were reset after test and 1214 were replaced. Of the 1214 meters not reset, 1157 were scrapped for under-registration and as too expensive to be repaired. The remaining 57 of the 1214 not reset, were salvaged for later installation in other places.

The city's meter maintenance program is credited with the high percent of accounted-for water recorded in Sheboygan. In 1953 the accounted-for water totaled 90.9 percent of all water pumped into the distribution system. The unaccounted-for water is ascribed to underground leaks and fire protection service, since all other consumption is included in the 100 percent metering program. In Sheboygan all public buildings, schools and other public installations are metered.

An interesting sidelight on water works practice is the fact there is no differential in rates for various

● METER repair man fills out meter test and repair form used in the periodic testing program of Sheboygan. Note 4-unit testing bench is shown.

categories of users. On the basis that water costs just so much to gather, treat and distribute, the same rate is charged to all consumers whether residential, industrial or public. A sliding scale, however, provides for volume consumption.

Back in 1931 when the filtering of Sheboygan's water supply was begun, the Wisconsin Public Service Commission ordered 100 percent metering. At that time, the community had 8,000 customers, of which 60 percent were metered and 40 percent were on a flat rate.

"We must be assured that every cubic foot of consumed water is proven to be correctly charged, because profits of a water utility must be available not only for the operation and maintenance of the water system, but also to provide funds for improvements and expansion," Mr. Hammes said.

This, of course, calls for efficient operation both in office procedures and in every facet of the condition and use of the community's 11,044 residential meters and 156 others used by 109 industrial-commercial customers. Office personnel consists of five employees, two of whom devote full time and two part time to customer billing, collecting and accounting. In addition, there are four employees in the meter division who read about 90 to 120 meters each day over a 10-day period each month. The rest of their time is spent in removing, repairing and resetting meters, testing meters and hand-delivering water bills promptly. This latter system keeps complaints of non-delivery of bills, very low, he added.

Residential users are billed quarterly and the city is divided into three billing districts with customers' billings staggered to about one-third of each district for each of the three months of the quarter. Industrial and commercial meters are read and billed monthly. Under a system in effect since 1949, "meter reading" sheets are prepared for a four-year period. Meter readers' subtractions are rechecked in the office, but only one or two in a book of 200 sheets normally are in error. When a meter is stopped or no reading is possible, an estimated bill is rendered based on an average for the similar period in the past two years.

Prompt attention to repairs so that high consumption may be cut down has gained customer good will and has reduced disputes and complaints of high bills. If there is any indication of leakage in the service line or fixtures, the meter reader makes a note on the meter reading sheet and leaves a "customers' premises note" at the door. If the owner is not the occupant, a copy is mailed to the property owner as well so there will be no delay in correcting the situation.

For every meter purchased, a "meter record card" is kept on file, showing a record of the meter from the date purchased until it is scrapped. This card shows the make of the meter; manufacturer's number; size; folio number; date received; cost and purchase voucher reference; date placed in service; location; customer classification; various dates and purposes of removals from service; meter reading on date of removal; and details of test and nature of repairs, date reset and remarks. It shows the repetition of meter repairs and various changes of location during its life. "This information is very essential in the correction of defects and in the settlement of complaints," Mr. Hammes says, "since it gives a complete history of each meter."

The Sheboygan utility makes no customer connection until there is an application for service signed by the owner. A follow-up card is made at the time of the application so inspectors can note the progress of the work as well as the source of water for house construction and arrange billing such use of water at flat rates. The utility makes all taps in water mains. The plumber lays in the customer's service from the main at the owner's expense, and it is maintained by the owner.

The total cost of street mains is borne by the utility. All meters are owned by the utility and are issued free to plumbers, who make the original installation at the owner's expense. In case there is more than one installation in a building, each unit is entitled to a free meter regardless of size of meter. When a meter is issued to a plumber, a meter installation inspection follow-up card is made out so that the utility's inspector can check to see that the work was done properly and promptly. Plumbers turn water on for new customers, but the utility turns water on and off after that whenever requested for such reasons as vacancies, vacations, remodelling, etc. It also removes and resets meters at the utility's expense.

There is no chance of a new customer being missed because of the utility's follow-up inspections. The building inspector's office submits a weekly list of construction permits which provide a cue to prospective customers, too.

Because the community is 100 percent metered, the meter reader would quickly spot any omission that might slip through by the fact that he had no card for an occupied place; and he would report it to the office for correction. In that way an unrecorded account would never be more than three months old before it was discovered. In the case of skipped meter readings, the water department does not make repeat calls. Instead, it leaves a self-addressed post card when readers do not gain admittance. The card has a diagram of the meter dial and instructions to the customer to fill it out and mail it. About 250 such cards are distributed monthly on meter reading calls out of 3,500 meters being read in each district per month. Of the cards, 85 percent are returned with the reading, and of that total 98 percent are correct. This, he added, greatly reduces the need for estimated readings.

Because of sanitary and health regulations, the city council of Sheboygan has ordered that water is never turned off because of nonpayment of bills. Arrears are carried forward from quarter to quarter until the end of the fiscal year. Tax notices then are mailed to the owner, fixing a deadline for payment before transferring the debt to the city comptroller for special assessment against the property involved and having it collected by the city treasurer along with other taxes.

Water Service in Sheboygan is provided by a Board of Water Commissioners consisting of Arthur H. Gruhle, president; Emil Marquardt, secretary; and Edwin S. Fessler, board member. Jerome C. Zufelt is superintendent of the Sheboygan Water Board.

● **TESTING a 2-inch disc meter used in a commercial installation.**

CHEMICALS REDUCE COST OF HIGHWAY ROADSIDE MAINTENANCE

OLIVER A. DEAKIN,

Engineer of Parkway Design,

New Jersey Highway Authority

Every-day maintenance of our highway roadsides is a continuing part of overall highway maintenance expenses. Due to the ever-increasing shortage of hand labor and its high cost, every avenue of possible saving should be explored to the fullest degree. Intelligent use of chemicals for grass, weed, and brush control offers many possibilities. Many State Highway Departments have been using chemicals to advantage in helping to control and reduce the cost of weed and brush maintenance. Our situation to date is a little different in that most of our State Highways have been completely graded and seeded. In many cases the entire right of way has been seeded to highly desirable permanent grasses, resulting in a good turf cover. Frequent mowings reduce unsightly and undesirable weeds to a minimum. Such maintenance of the grass areas helps to keep new woody plant growth under control.

We can think of weed and brush control as a matter of replacement of undesirable species with desirable plant growth. Some of the noxious weeds and plants along our highway roadsides are giant ragweed, dwarf ragweed, and poison ivy. These plants are a definite hazard, both to the abutting property owners and to the highway maintenance workers. Many hours of lost time and human suffering is caused by these weeds. The presence of poison ivy and giant ragweed in roadside picnic areas is most undesirable and they should be eliminated for the protection of the public using these recreational facilities. They can be controlled by chemical sprays.

On many Township and County roads, where weed and brush control is an ever-present problem, the use of 2, 4-D and 2, 4, 5-T can be utilized to a good financial advantage, replacing mowing and cutting much of the roadside brush growth by hand methods. When the old-time method of brush removal is practiced the result is that where one small woody plant existed, two or three new sprouts appear in its place within a short period of time. Removal of brush by hand cutting is slow, tedious, hazardous, and an expensive operation.

Estimates for hand cutting are $200 to $400 per mile, once every second or third year. By using the chemical spray method, it costs $35.00 to $40 per mile for the first year; the second year about $25.00 per mile for re-spraying; and the third year about $10.00 per mile. Roadside spraying with 2, 4-D and 2, 4, 5-T is thus much easier, faster and, of course, cheaper than hand mowing and cutting of weeds and woody vegetation. This is especially true on roadsides that have never been completely graded and seeded to grass.

Where cut slopes and high embankments are too steep for the establishment of grass, the New Jersey State Highway Deparment has used Hall's Honeysuckle (*Lonicera Japonica Halliana*) very effectively as a woody ground cover vine to control soil erosion. The use of honeysuckle in many locations has been limited because of its spreading habit. Adjacent to farm or woodland it may become a nuisance. However, with 2, 4-D available that objection to planting honeysuckle does not exist. Honeysuckle is very sensitive to 2, 4-D and can be kept from spreading by using this chemical.

The selective weed killers, such as 2, 4-D have been used rather extensively by many state highway

● **APPLYING** MH-40 **at rate of 4 lbs. in 50 gallons of water per acre. This procedure reduces the number of mowings required in the difficult places.**

● GRASS and weeds are higher than the guard rail; mowing is slow and costly.

departments for control of susceptible perennials, noxious weeds, broad-leaved weeds, and some woody plants. The 2, 4, 5-T is superior to 2, 4-D for control of brambles such as blackberry and raspberry, and osage orange. Combinations of 2, 4-D and 2, 4, 5-T are used where species susceptible to both products occur in the same area.

The maintenance of large informal bay areas, free of sprout growth, along the edge of woodlands on the Garden State Parkway, Palisades Interstate Parkway, and Rockefeller Memorial Highway is easy and economical when a chemical spray mixture of 2, 4-D and 2, 4, 5-T or "Ammate" weed killer is used. "Ammate" weed killer gives 95 percent to 100 percent control within 10 days or 2 weeks. The use of 2, 4, 5-T in fuel oil as a basal bark selective spray produces very good results. It is most effective when used during the dormant season.

Highway safety is always kept in mind in the maintenance of the roadside. Brush and weed growth on curves and approaches to intersecting roads may be controlled by chemical sprays. Proper sight distance must always be provided for the safety of the motoring public. Cautionary signs may be kept visible by use of spray materials.

Roadside fire hazard may be greatly reduced by the eradication of tall growing weeds and brush, especially close to the shoulders of the roadway where a discarded cigarette may easily start a fire during the dry spring and fall months. Soil sterilants may be economically used to advantage in maintaining miles of fire lanes, parking areas and bridle and footpaths along highways and parkways where no vegetation is wanted.

In order to reduce maintenance cost of repairing and possibly rebuilding grass areas in the vicinity of our service areas where we provide restaurants and gasoline stations for the motoring public, as on the Garden State Parkway, 2, 4-D will be used to control plantain, buckhorn, mustard, thistle or any other broad-leaved weeds. Weed-free turf also has a much finer appearance and is more attractive to the public.

The experimental work that is being done in Connecticut on the Merritt Parkway and the results obtained to date by using MH (Maleic Hydrazide) as a grass growth inhibitor is well worth following closely. It has possibilities of reducing highway and parkway mowing cost as much as $70 per acre per season. This material is non-toxic and presents no equipment cleaning problem. The optimum application is 15 pounds of MH-40 in 50 gals. of water per acre for roadside shoulder treatment. This, applied by a nozzle mounted off-center, and throwing a fan spray at 200 pounds pressure, has given satisfactory results. Low-pressure, low-volume equipment has been used for spraying medial zones. Four pounds of MH plus three pounds of 2, 4-D has given good control of such weeds as wild carrot and plantain, at the same time inhibiting grass growth. Grass treated with MH had to be mowed only twice as compared with 19 cuttings on untreated check plots. Areas treated with 10 pounds per acre of MH 40 one year and retreated with the same dosage the next year required no mowings during the second year.

The use of Maleic Hydrazide to inhibit grass and weed growth in the vicinity of guard rails, sign posts, lighting standards and shade trees can account for a great saving in labor cost in maintenance of our ever-increasing mileage of highways.

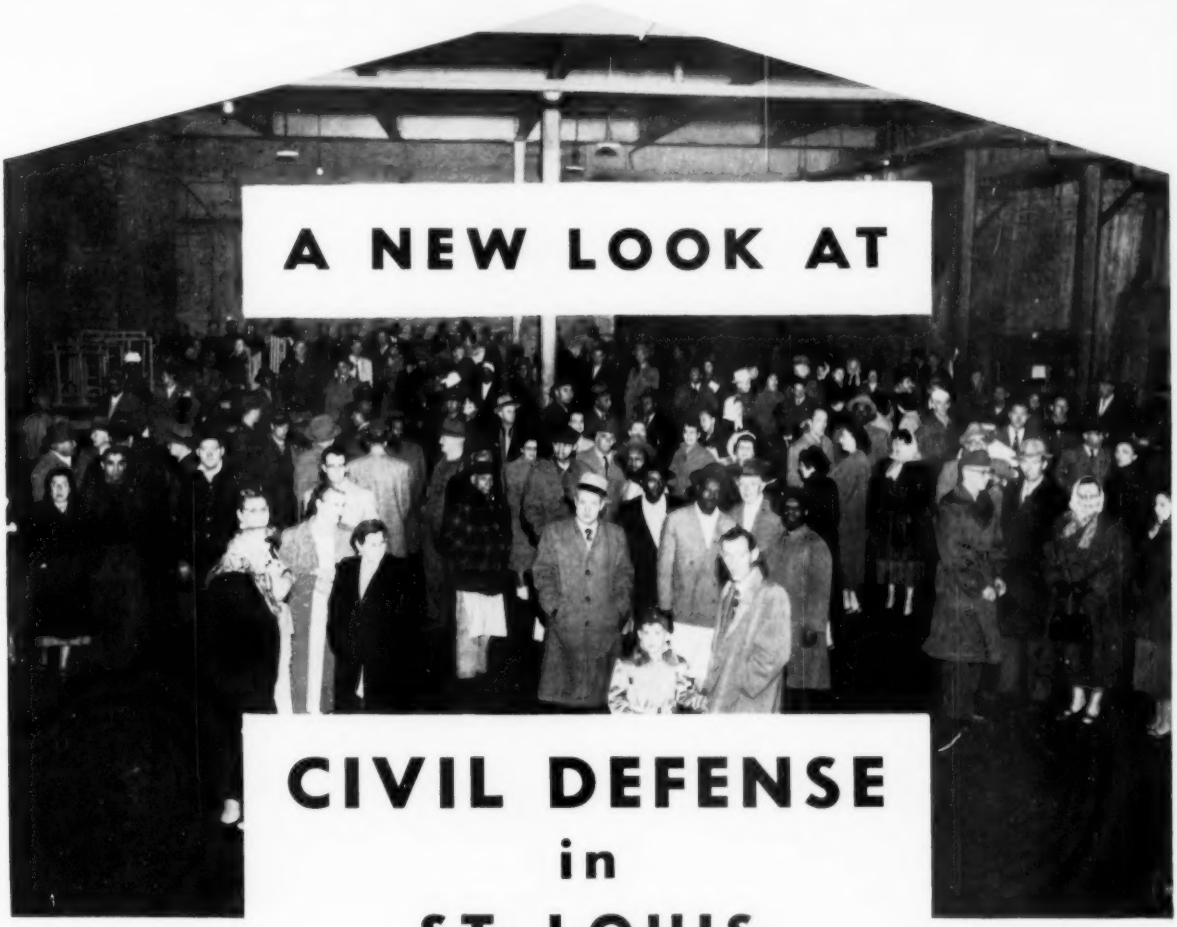
The use of old and new chemicals to control weeds, brush, and grass along our highways requires an understanding of the problem and what we expect to accomplish. Promiscuous and indiscriminate spraying of herbicides along our roadsides will bring public criticism. Maintenance crews must be thoroughly trained so they understand the proper and safe use of chemical sprays for weed, brush, and grass control as they concern highway maintenance problems.

Careful use of herbicides during the proper season can be an invaluable tool for reducing highway maintenance cost, increasing highway safety, and making our highways more enjoyable, healthful, and attractive to travel during all seasons of the year.

● ● ●

Four-Lane Highway in North Carolina Mountains

Those who have driven over the old 8-mile section of US 70 between Old Fort and Ridgecrest, N. C., will appreciate the new 4-lane highway with 4-ft. raised median strip. The old road had 98 sharp curves—some very sharp. The new road, in addition to being two miles shorter, has a maximum grade of six percent and 19 easy spiral curves of six degrees or less—with one seven-degree curve. The two lanes going each way are 22 ft. wide. Location is on the south side of the mountains to reduce snow and ice hazard. A total of 3,100,000 cu. yds. of earth and stone excavation was necessary; and there is one fill 178 ft. high. A 66-inch metal pipe 576 ft. long is located under this fill and records to date show it is carrying the load well. Cost was in excess of $2.6 million for the grading alone. W. H. Rogers, Jr., is North Carolina State Highway Engineer; the work was done in the 13th Highway Division, W. M. Corkill, Division Engineer, State Highway Department.



A NEW LOOK AT CIVIL DEFENSE in ST. LOUIS

PAUL G. STEINBICKER

Civil Defense Executive

THREE and a half years ago, St. Louis adopted its first civil defense ordinance. In midsummer, 1952, a survey of the progress attained to that time was prepared and this was published in the August, 1952, issue of *Public Works Magazine*, under the title "A Civil Defense Program Your Community Can Follow". Now, another 18 months have passed. An uneasy truce has been negotiated in Korea. Our government has reported on its test of thermonuclear weapons, better known as H-Bombs. A few months ago the Soviet Union also succeeded in exploding, such a device. All the major developments of the past year and a half have served only to confirm the St. Louis decision of 1950: Civil defense continues to be a basic municipal necessity, and will remain such for an indefinite period in the future. In view of this, it seems appropriate now, in July, 1954, to re-assess the progress made in this area, and to suggest possible lines of development for the future.

Organization and Finance

First of all, the basic civil defense legislation applicable in St. Louis has been distinctly improved through the enactment a year ago of a new and better civil defense ordinance. The most important change is the extension of civil defense responsibilities to natural emergencies. The ordinance defines a natural emergency as "any state of emergency caused by any actual or impending flood, drought, fire, hurricane, earthquake, storm or other catastrophe in or near the City of St. Louis, and involving imminent peril to lives and property in the City of St. Louis." The ordinance abolished the unwieldy and unnecessary "Civil Defense Council," but continued the basic arrangement for a civil defense organization and included provision for a Civil Defense Advisory Committee, to consist of the Mayor as Chairman and four mayoral appointees. At the present time, two vacancies exist on this committee. Serving at present are Howard F. Baer, President, A. S. Aloe Company, and Adrian W. Frazier, President, Frazier-Davis Construction Co.

The major personnel change in the organization of the Office of Civil Defense occurred when Raymond R. Tucker, who had been Director since January, 1951, was elected Mayor of St. Louis on April 7, 1953. He appointed as the new Director, Brigadier General Francis P. Hardaway, (USA, ret.), who had been the Chief Administrative Assistant since early 1951. In other

● **BEFORE the red warning signal was sounded during a recent civil defense drill. This is Sixth St., looking north from Locust, showing normal traffic.**

respects, except for a few personnel changes, the organization of the Office of Civil Defense remains basically the same. In addition to the post of Director, there are five professional positions: One Deputy Director, and four Civil Defense Executives in charge respectively of Personnel, Public Affairs, Planning and Procurement.

Financial support for civil defense in St. Louis, as provided by the Board of Aldermen, continued on a modest though generally adequate scale. The City has been spending at a rate of approximately $100,000 per year; and for the fiscal year to April 1955, the city's share of civil defense expeneditures will again exceed $100,000. In addition, civil defense in St. Louis has received financial assistance from the federal government totalling to the present time approximately $120,000. The bulk of this was provided, on a matching basis, for a city wide air-raid warning system and for various special communications equipment; hence, the federal expenditure in the city is not expected to be as high in the current fiscal year as it has been in the past.

In this same connection, mention must be made of the inestimable contribution to civil defense in St. Louis by many other local sources. No monetary estimate can be made as to the value of these contributions, which over the past three years have been immeasurable. Without it, civil defense in St. Louis could not have advanced beyond the embryonic stage. With it, a satisfying degree of readiness has been attained. As of this writing, well over forty thousand persons, along with many millions of dollars of material and equipment, have received well-coordinated and planned assignments in the organization.

The Public and Civil Defense

A major phase of adequate civil defense involves the public, which must be informed as to the need for civil defense and as to its role in civil defense. Every known medium of communication has been, and will continue to be, employed to bring basic civil defense informaot a nhour or more of warning time tion to the public. Printed materials, both national and local, have been distributed widely. The press has given generous space to all forms of civil defense information. Radio, television and film materials have been developed and used. A Speakers' Bureau stresses the personal touch in civil defense. The schools of St. Louis, both public and private, have made great strides in informing and training the children. Recently, an identification tag program has been undertaken whereby every St. Louisan, in and out of the schools, can have an adequate identification tag, at nominal cost, containing name, address, religion (if desired) and blood type (if available.)

● **INCOMING message center at CD Headquarters as "all clear" sounds. Observers report from all over city.**

A second major aspect of civil defense involving the public is an adequate attack warning system. Fortunately, St. Louis now has such a system. It consists of 127 air-raid sirens, of five horsepower each, located at carefully selected spots throughout the entire city. Each siren, with a frequency of 400 cycles per second, thus emitting a distinctive low tone, has been geared to produce about 113 decibels at 100 ft., assuring a volume of sound adequate for all external ambient noise levels. The sirens are so located that no persons will be more than ¼ mile from a siren in the central area of the city or more than ½ mile from a siren elsewhere in the city. The system, operated centrally by remote control from locations undisclosed, was thoroughly tested, and a public participation drill was carried out on January 16, 1954, with impressive success. Preparations were thorough and complete: and the drill achieved nearly 100 percent effectiveness. Both vehicular and pedestrian traffic was brought to a practically complete halt; people followed the instructions by seeking available shelter inside large buildings; persons at home cooperated. Plans for the future include periodic "growl" tests of the warning system (four such tests have already been held in 1954); a possible "repeat" drill held without advance publicity as to the exact time for holding it; and, the inclusion in future drills of the civil defense services as well as the public.

A third aspect of civil defense in which the public is directly concerned is the public shelter program. There has been practically universal agreement that the construction of special bomb shelters would be ill-advised; national information on the subject has stressed dependence upon existing structures, with evaluation of such structures based on the criteria established by the FCDA. The shelter problem in St. Louis has been recently accentuated by two developments. The first of these is a re-

cently completed survey of downtown St. Louis which showed that there is acceptable shelter space for less than half of the persons in the area. This leaves over 100,000 persons in the downtown area with no shelter or inadequate shelter during peak periods (daytime on weekdays). The second development is concerned with the length of warning time which might be anticipated in St. Louis. In recent months, though with no positive commitment, the local Office of Civil Defense has been informed that St. Louis could be reasonably sure of receiving at least one hour's warning of any actual or impending attack. This involves a fundamental point in civil defense planning in St. Louis. A basic assumption in earlier plans was that an attack might come with little or no advance warning Hence, it would not be possible to evacuate the city. As indicated in a progress report dated in 1952, (Public Works Magazine, August, 1952) "all plans must be built upon the fact that the city's people must stay where they are when the warning is received."

This assumption seems no longer justified. If the city can be assured of an hour or more of warning time, consideration can be given to evacuation. Since the shelter survey has revealed inadequate shelter space in the downtown area, the desirability of evacuation becomes even more urgent. Therefore, the Office of Civil Defense has undertaken a restudy of the entire civil defense plan, with particular stress upon the practicability of a partial or a total dispersal of the population upon receipt of a warning. Of course, the possibility of attack with little or no warning continues to exist, and for such an eventuality, existing plans must be maintained. But, supplemeting such plans, others are in process, based upon the inadequacy of shelter and the longer warning time. These involve the analyses of available routes for mass evacuation, of the methods of transportation, and of the numbers involved.

One inevitable development of this study soon resulted. Almost immediately, it became obvious that the problems involved were not problems for the city alone. Both St. Louis City and St. Louis County (containing 94 municipalities with a total population of a half million) had to face the new problems *together*. In May, a joint meeting of city and county civil defense staffs was held. On both sides there was full recognition that any really effective dispersal plans involved both jurisdictions. It was therefore agreed that, though the bulk of the planning responsibility would remain with the City, the basic objective would be the development of an area-wide plan, with complete coordination of city and county facilities to be maintained throughout. As a result of the agreement at this meeting, staff members of the City Office of Civil Defense have already consulted with various County officials on such phases of the problem as transportation routes and transport methods.

Meanwhile, the plan is not yet ready. For the next several months, the St. Louis area will remain in a state of transition. The St. Louis Office of Civil Defense has concluded that, for this twilight period, the following instructions for the public are the best possible:

A. *Attack with NO warning.* Act just as you were previously told to act: DUCK AND COVER instantly.

B. *On a Red Warning* (sounded on the air-raid sirens): Act just as you were previously told to act. Find the best available shelter nearby, and do it quickly.

C. *On a Yellow Warning* (made public by every means except the sirens). This warning means that an attack is probable within *an hour or more*. 1) If you are in a congested area, such as downtown, start moving outward, by the best means available (car, train or on foot). Be calm and don't get panicky. Just move *outward*—away from congestion. If you are in a uncongested, fairly distant residential area, it will probably be wisest for you to go to your pre-arranged shelter, make sure it is properly equipped, and turn on your radio (at 640 or 1240 on the dial), for further instruction.

The Civil Defense Corps

So far as the organization of a Civil Defense Corps is concerned, the basic structure developed in the early stages of civil defense in St. Louis and outlined in the August, 1952, *Public Works* article, has continued without change. Such a Corps would continue useful in the crisis condition following an enemy attack, even though the attack came after considerable warning; and it would be of inestimable value in case of an attack with

(*Please turn to page* 126)

● **AFTER: Three minutes after the picture on the opposite page was taken, this is the way Sixth St. looked—deserted except for a few police officers.**

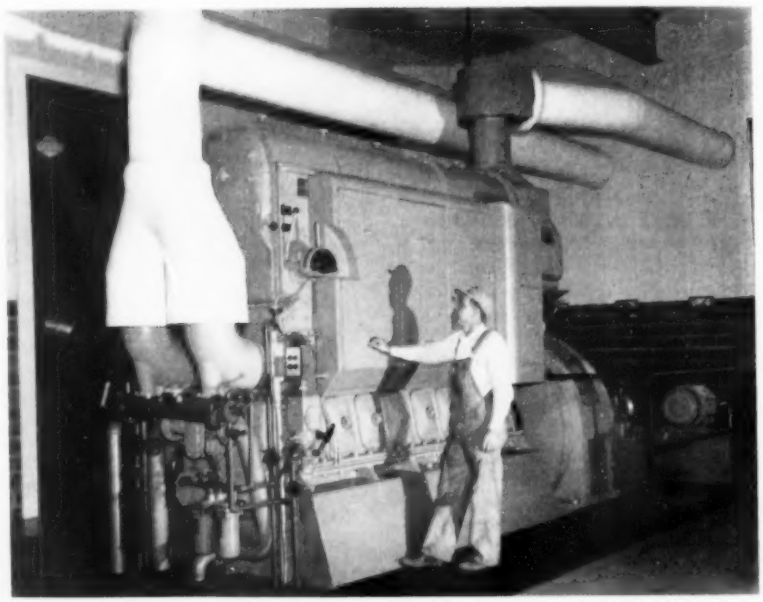
● **CIVILIAN Defense Headquarters at height of activity after a test drill. Results are plotted on map in center.**

● **SHOWPLACE: The modern municipal power plant at Westbrook, Minnesota.**

POWER PLANT is a CIVIC SHOW PLACE

THOUGH having a population of only 1,017, Westbrook, Minn., recently dedicated its expanded municipal power plant. This is a thoroughly modern, efficient 4-engine diesel plant which in 1952 earned a net profit of $17,243. In effect, the dedication ceremonies were a testimonial to the success of a municipal venture and evidence that a small progressive town can provide its citizens with electricity at modern rates, with unfailing service, and still show a substantial profit.

It was 15 years ago that Westbrook, with a population then of only 610, puts its generating plant into operation. The original prime movers, still in service today, were two Fairbanks-Morse diesels, one rated at 300 hp., the other at 225 hp. Since then, Westbrook has grown 60 percent in population and consumption of electricity has jumped 396 percent. To meet the rising demand, it was necessary to install a third engine in 1941, a 700 hp. F-M diesel. The three units carried the load for a dozen years, though for the last six years peak loads exceeded the firm capacity of the plant. To reestablish a firm capacity in excess of peak loads, an expansion and improvement program was initiated and a Fairbanks-Morse opposed-piston diesel engine was acquired. This new engine delivers its rated horsepower at 720 rpm. and is direct-connected to a 675-kw., 3-phase, 60-cycle, 2400-volt alternator. The addition of this extra power enables the plant to carry on without fear of a shutdown, even if one of the two largest units should suddenly go out of service. The other three engines are rated at 482 kw., 200 kw. and 148 kw. respectively, and the peak 15-minute load recorded in 1952 was 620 kw.



● **PLANT Superintendent T. H. Ramsborg looks over his new F-M engine. Also shown are the Woodward governor, Nugent oil filter and fuel and lube pumps.**

Westbrook officials look even further ahead and have plans to convert the new opposed-piston engine to dual-fuel operation just as soon as a projected natural gas pipeline is constructed. This will substantially increase the fuel-cost savings already provided by the new equipment.

Since 1938, the small but efficient plant at Westbrook has recorded a total net profit of $129,911 after interest and depreciation. In the meantime, the cost of electric energy to the consumer has dropped from 4.77 cents in 1939, the first full year of operation, to 3.32 cents in 1952, a decrease of more than 30 percent. Electric power generation in this period increased from 607,135 kwh in 1939 to 2,398,030 kwh in 1952, a jump of 396 percent. Thus the Westbrook Municipal Light and Power Utility has achieved an almost perfect record of dependable service without interruption at continuously declining cost to the consumer, and has done this at a steady annual profit.

In its first seven months of operation, the new engine generated a total of 341,890 kwh, consuming 27,070 gallons of fuel and delivering power at a rate of 12.6 kwh per gallon. In contrast, the three smaller units generated a combined total of 1,021,660 kwh, delivering power at the rate of 12.084 kwh per gallon of fuel consumed. But in a series of tests conducted recently by an oil company which supplied lube to the plant, this engine generated power at the rate of 13.72 kwh per gallon of fuel consumed.

In normal operation, the four units are balanced as much as possible in terms of service. The new engine, the most powerful one in the plant, usually runs between the hours of 6:30 AM and 11:00 PM when the load is heaviest. It alternates on this schedule with two smaller engines

(*Please turn two pages to page* 112)

● 120-INCH pipe diverted stream at damsite. Below, a section of pipe line.

MORE WATER:
Southern City Puts End to DROUGHT HAZARDS

A. C. PARKER, City Engineer, Tuscaloosa, Alabama

LIKE many other communities over the country, Tuscaloosa was hard hit by the prolonged drought in the summer of 1953. But it could have been worse, because despite some lack for lawns, cars and other desirable uses, there was enough water for domestic requirements and fire protection.

But you couldn't say the city was caught napping. As early as 1945, George Jacob Davis, Jr., former Dean of the Engineering School of the University of Alabama, reported a growing need for more water to serve the needs of a rapidly expanding population. Moreover new water consuming industries were constantly moving into the area.

City officials agreed with Mr. Davis' report and immediately began to emphasize the need to the citizens. By 1952 a bond issue for $2,000,000 had been passed by the voters to provide new water facilities. Construction of a new water line and reservoir was already underway before the drought came on in 1953.

Harris Lake has been the source of Tuscaloosa's water supply. This billion-gallon reservoir was built in 1929 by damming Little Yellow Creek. Before then the city drew its water from the Warrior River, which passes through the city. But when this source became contaminated we were forced to shift to Yellow Creek.

Various measures were taken to increase water supply between 1929 and 1953. A supplementary 24-inch diameter Armco steel pipe line was installed in 1948. Later, pumps were added to increase the flow. Even this did not satisfy the growing need for more water.

The Current Program

The current program includes a new reservoir and a new 36 and 24-inch diameter water line. A total of 23,495 feet of 36-inch and 2,531 feet of 24-inch Armco welded steel pipe was specified for the job. All pipe was ¼-inch wall, lined, coated and wrapped, manufactured to AWWA Specifications C201 and C202. A large part of the line is elevated on concrete piers. Dresser couplings were used on the project. During the worst of the 1953 drought, part of this line was used for emergency service. Pipe had been installed from the plant to the North River where two pumps were placed in temporary operation.

There were three river crossings, the largest of which utilized 36-inch diameter, ⅜-inch wall welded steel pipe with field welded joints. Two others were 24-inch cast iron pipe with molax joints. A 4400-foot and a 1600-foot rock tunnel also form a part of this line. The two tunnels are being constructed to a minimum 3x6-foot section.

The reservoir under construction on Little Yellow Creek, above the existing Harris Lake will have a storage capacity of 5,170 million gallons. Beyond this a third reservoir of 3 billion gallon capacity is projected.

● **SECTION of the spiral welded steel pipe with take-off valve.**

● **DRESSER coupling is being coated with bituminous material prior to completing the joint. Note pan under joint and protective coating on the pipe.**

The dam for the reservoir now being constructed will be 91 feet high with a maximum base width of 500 feet and a base length of 500 feet. It is the earth fill type with clay core. The upstream face will be riprapped while the downstream side will have a rock fill. Toe drainage is provided by some 500 feet of 6-inch Hel-Cor perforated pipe.

How to divert the stream during dam construction was a problem. An economical counter solution to a rock tunnel was found by assembling a 120-inch diameter Armco Multi-Plate pipe along one side of the gorge through the site of the dam. This pipe is 358 feet long, constructed of 1, 3, and 5-gage material. Until the dam is completed, the pipe will carry the flow of Little Yellow Creek. When the fill is in, the pipe will be plugged with materials of a density equal to that of the dam section. It is estimated that this idea will save the city at least $40,000 of the cost of diverting Little Yellow Creek.

George Jacob Davis & Son, Consulting Engineers of Tuscaloosa, designed the dam, reservoir, pipe line and tunnels; Woodman-Keith Engineering Company, Consultants, Tuscaloosa, designed the bridges, access roads, etc.; and the City Engineering Department made the necessary surveys. Administration of the contracts and inspections was handled by the City Engineering Department.

J. Hal McCall is Mayor; J. Frank Livingston, Commissioner of Public Safety; W. H. Nicol, Commissioner of Water Works and Finance; C. S. Read, Water Works Superintendent; Edward E. Love, Assistant Superintendent. Alvin Dupont is in charge of surveys and construction; Robert V. Hawkins is general supervisor; W. V. Pritchett is in charge of plans; J. O. Miller is Inspector, and B. R. Ballard chief of the survey party. The pipe line contractor is Arthur Pew Construction Company, Atlanta, Georgia; contractor for the rock tunnels is N. R. Thomason, Montgomery, Alabama; Oman Construction Company, Nashville, Tennessee, is the contractor for the dam, reservoir and access roads.

Power Plant is Civic Showplace

(*Continued from page* 110)

operating together; and the smallest engines carry the comparatively light loads encountered between 11:00 PM and 6:30 AM.

An unusual feature of the plant is the striking color scheme used in painting the equipment, piping and plant interior. All fuel lines and pumps are painted red for ready identification; lube oil lines and equipment are painted purple, air lines blue, and water green. The floors are painted a dust gray, blending with the chartreuse beams. Fluorescent lights provide maximum illumination. The colors are changed periodically and are chosen by a vote among all hands. Officials at the plant find that this arrangement exerts a healthy psychological effect on the operators, making the plant a more pleasant place to work.

Ultimate responsibility for the plant rests with V. A. Stark, Mayor of Westbrook, and with the Village Council, consisting of E. R. Tillisch, Howard Ericson, Viggo Bargman and J. A. Melena. Members of the four-man Light Commission are: A. E. Peterson president; H. G. Boeck, secretary; L. L. Klasse, commissioner, and T. H. Ramsborg, superintendent at the plant since 1939. Plans and specifications for the recent expansion and improvement program were prepared by Victor Etem, president of Associated Consultants, consulting engineers of Minneapolis.

Most communities of 610 population assume they are too small for successful operation of a municipal power plant. Westbrook's experience indicates that even towns well under 1,000 residents can provide citizens with a dependable power supply at moderate rates; and Westbrook's net profit proves that such a small town plant can be highly profitable.

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Cheaper to Treat Elms Than to Cut Them Down

Toledo, Ohio, of which Joe Sweeney is City Forester, is fighting the elm blight; and it is cheaper to do this than to let the trees die and have to remove them. It costs only about $2 per year to spray a tree, but it costs $80 to remove a relatively small tree and $200 to $400 to remove a large one.

THREE-PHASE

Actuated Signals Handle

HIGH TRAFFIC VOLUMES

G. M. WEBB,

Traffic Engineer,

California Division of Highways

This is a paper presented by Mr. Webb at the Seventh Annual (1954) combined meeting of the Western Section of the Institute of Traffic Engineers and the Northwest Traffic Engineering Conference. It is published here through the courtesy of California Highways and Public Works.

THE primary reason for installing traffic signals is to facilitate the movement of traffic, and to do this in a safe manner. The installation of signals without justification, or the installation of a signal system which has not been designed for a particular location may result in an increase in accidents.

There are many locations on the State Highway System in California which have had traffic volumes to warrant a grade separation for many years, but because the demand for highway improvements far exceeded available funds, we have been unable to provide the necessary grade separation structures. At such locations, traffic signals are operating with exceedingly high volumes. Capacity and accidents are the problems at these intersections.

Left-turn Movements

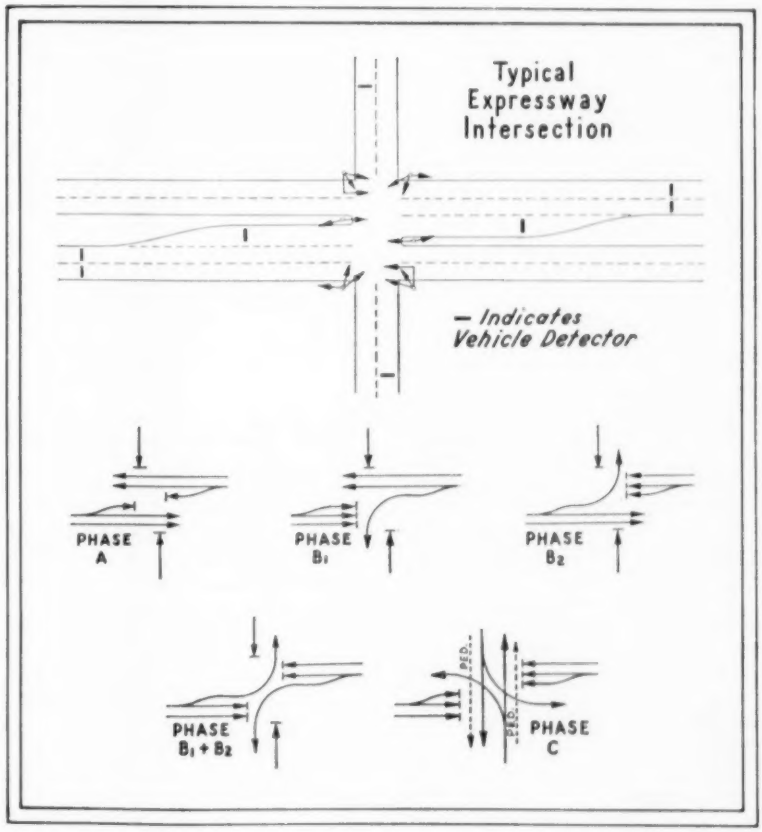
One phase of the accident problem is that of accidents involving left-turn movements. With the usual two-phase signal, the motorist desiring to make a left turn from a major highway must pick a gap in the fast-moving opposing through traffic. During this time, he is in a position which may result in a fast-moving through vehicle running into the rear of his car. In addition, while he is waiting he is reducing the capacity of the intersection. Because of this, it has been found necessary to provide a left-turn median lane for this motorist. This reduces his likelihood of having a rear-end type of collision, but does not affect his problem of picking a gap in the opposing through traffic. If he takes a chance and does not make it, the result is often a serious accident. In order to reduce this potential accident hazard, we are finding that it is frequently desirable to provide three-phase signals with a separate phase for left-turn movements especially on rural, high-speed highways. We have found that the replacement of two-phase signals with three-phase signals has reduced accidents involving left-turn vehicles.

● FIVE different arrangements care for most traffic problems. Explanations are on the next page.

Three-phase Signals

On ordinary city street intersections, three-phase signals are not usually installed unless the left-turn movement is quite large, that is, 10 to 15 percent of the entering traffic. On rural expressways, however, because of the potential left-turn accident hazard, we now find it desirable to provide three-phase signals with a separate phase for left-turn movements of comparatively low magnitude.

The main objection to three-phase signals is the additional delay caused by the third phase. To hold this delay to the minimum, we are now using a system known as the



"double split-phase." In this system, there are five different arrangements of the signal indications.

In condition No. 1 we have the usual "A" phase for both the through movements. In condition No. 2 we have a "B_1" phase in which vehicles are permitted to go in one of the two left-turn median lanes. The through movement in the same direction as the left-turn movement is also permitted to pass through the intersection since there are no other movements in conflict with it. Similarly, in condition No. 3 we have a "B_2" phase which provides the same operation only in the opposite direction. When vehicles appear in both left-turn lanes, we have condition No. 4 which is a straight left-turn or "B" phase. Condition No. 5 is the "C" phase for the cross-street movement. This "double split-phase" system provides the minimum delay to the through highway traffic, and is especially useful where there are heavy directional peak hours in either the through traffic or the left-turn traffic.

Another recent development in three-phase signals is the three-phase partially traffic-actuated signal system for use in coordinated systems.

Traffic-actuated Signals

We have several locations where it was necessary to install a group of three-phase signals at such spacings that required coordination to provide a progression for the through traffic. At the same time, since there was a considerable variation in traffic during the day in both direction and volume, it was desired that these devices be traffic actuated. In some cases, the spacing of the signals would not permit an ideal progression in both directions at the same time. Recreational traffic on week ends attained a high volume on Friday afternoon in the outbound direction and on Sunday night in the inbound direction. The exact time and length of these peaks cannot be predetermined.

For such requirements, the three-phase partially traffic-actuated signal system is installed. The signal controllers are coordinated by interconnection to a master controller which contains cycle selection equipment. The cycle length and appropriate offsets are selected by the master equipment so that a progressive band is provided on the highway in the direction of the major movement. Sampling detectors are provided in the through-traffic lanes in both directions to provide the necessary information to the master equipment for proper selection of cycle length and direction of the offsets.

Use of Detectors

No detectors are placed in the through-traffic lanes at the individual intersections. The detectors are placed only in the left-turn lanes and on the cross-street approaches.

Consider an example with 50 percent of the cycle length available for the through traffic and 50 percent for the left turn plus cross traffic. Thus with a 100-second cycle operating, and with saturated conditions on the left-turn lanes and cross street, there will be 50 seconds available for the through traffic, 25 seconds for the left turn, and 25 seconds for the cross-street traffic. If either the left turn or cross street does not require the entire time, the remainder of the time can be added to the other movement. If there is neither left-turn nor cross-street traffic, the green will remain on the highway. Then when vehicles do appear in the left-turn lane or the cross-street approaches, they will obtain a green indication only during a "permissive period," which will not interfere with the major highway progression.

• • •

Value of the Yield Sign

According to Action for Safety almost 100 cities and 15 states using the yield-right-of-way sign report that accidents have been reduced because of it.

A Complicated Pipe Laying Job for Flood Control

● JOINED to preceding section, pipe is ready to move down slope.

● DIRT was chuted down pipe and later removed with a skip loader.

IN BUILDING a section of Los Angeles' flood control project, it was necessary to lay a section having two vertical curves, the bottom one ending in a 30° slope down into Santa Monica Canyon. The bluff presenting this problem was 65 ft. high. The pipe was of reinforced concrete, 51 ins. in diameter and in 8-ft. long sections, furnished by United Concrete Pipe Corp. Charles Burch & Sons, the contractor, employed an unusual approach. First step was to dig a shaft 24 ft. deep at the top of the bluff. Then a pilot tunnel was hand dug to join the grade of the bottom or outlet section, which was set in place, using several sections of beveled pipe. A concrete cradle was poured in the bottom of the pilot tunnel, establishing line and grade. Then the remainder of the pipe was lowered through the shaft and lined up on the cradle. Gravity, the weight of the pipe and a "come-along" moved the pipe down the cradle to join the bottom section. Joints were plastered on the inside and grout poured in to fill the tunnel. The vertical curve at the top was laid in open cut. Paul Rappe was superintendent on this portion of the job; H. Berkowitz was inspector, under Harold Ball, senior inspector for the County.

APWA News

AMERICAN PUBLIC WORKS ASSOCIATION
1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

'54 Congress Features Action-Packed Program and Large Equipment Show

NATIONWIDE attention is now being focusted on the 1954 Public Works Congress and Equipment Show to be held in Atlantic City, New Jersey September 19-22. Over seventy of the country's leading manufacturers of public works equipment and materials will display their products at this forthcoming Show which will be the largest ever sponsored by the Association.

The action-packed program begins with an address by New Jersey's Governor, Robert B. Meyner. A paper entitled—"Public Works and the National Economy" will be presented immediately after the Governor's talk, by W. A. Hardenbergh, President, Public Works Magazine. This will be followed by the Association's Annual Business Meeting.

The afternoon session on Monday, September 20, will be devoted to three Forums on Refuse Disposal, Sewage Disposal and Off-Street Parking. William Xanten, Superintendent, Division of Sanitation, Engineering Department, Washington, D. C.; Frederick H. Zurmuhlen, Commissioner, Department of Public Works, New York City and Kenneth K. King, Director of Public Works, Phoenix, Arizona will serve as moderators of the three respective forums.

Tuesday morning will be devoted to twenty question table discussions on a wide variety of public works subjects. Ten of these tables will be running concurrently during each of two periods. These "shirt-sleeve" sessions will offer Congressionaires ample opportunity to obtain a cross-section of professional opinion on the individual problems which they present for discussion. Each table will be staffed by a well qualified moderator and reporter.

Stanley Pinel, Management Engineer for New York City, will lead off the Tuesday afternoon session with a paper entitled—"Testing Performance In Public Works Operations". This will be followed by a panel discussion to be led by Glenn Richards, Commissioner of Public Works, Detroit, Michigan on—"Financing Urban Street Improvements". A paper entitled—"Equipment Replacement Policies" will be presented at the Wednesday Morning session by Carl H. Guider, Supt., Division of Motor Transportation, Detroit, Michigan. A panel discussion on—"Engineering and Construction Contracts" to be moderated by Lloyd Johnson, Commissioner of Streets and Sanitation, Chicago, Illinois will also highlight the Wednesday Morning program.

The equipment exhibition will be viewed by hundreds of top-ranking public works officials from all parts of the United States and Canada during each of the four days of the meeting.

Several awards will be presented at the Annual Banquet Wednesday night which will feature an address by Judge Harold C. Kessinger of Ridgewood, New Jersey.

Offner Appoints Resolutions Committee

At the Atlantic City Congress, members of APWA will pass resolutions on current controversial problems. The Resolutions Committee has requested that any member with an idea he wants "to get off his chest" send it immediately to one of the committee members. Procedures adopted by the APWA Board of Directors at the February 1, 1952, meeting are as follows:

(1) The Resolutions Committee shall consist of five active members.

(2) The President shall be ex-officio member and appoint four active members to the committee.

(3) All resolutions scheduled for presentation at the annual meeting of the Association shall be referred at a time prior to the meeting to the Resolutions Committee for recommendation.

(4) No action can be taken on a resolution without a previous report on it by the Resolutions Committee.

Sandenburgh is Chairman

Chairman of the Resolutions Committee is George Sandenburgh, City Engineer, Ann Arbor, Michigan, and members are as follows: Walter Daniel, City Engineer, Jacksonville, Fla., Stanley Palmer, City Engineer, Kansas City, Mo., Henry D. Harral, Street Commissioner, Philadelphia, Pa., and Milton Offner, Secretary, Board of Public Works, Los Angeles, California.

PARKER HEADS NEW SAN DIEGO-IMPERIAL CHAPTER

The nineteenth local chapter of the Association was organized at the Cuyamaca Club in San Diego, California, June 25, 1954. Its official name is the San Diego and Imperial Counties Chapter and the jurisdictional area encompasses those two counties.

Vern A. Parker, Assistant Director of Public Works, San Diego, was elected President of the new Chapter. Other officers are: First Vice-President, Virgil L. Larson, Pacific Telephone and Telegraph Company; Second Vice-President, L. Fred Hix, Imperial County Road Commission; Secretary-Treasurer, John W. Davis, Assistant Road Commissioner, San Diego County; Board Members at Large; Captain A. K. Fogg, City Engineer, San Diego; Warren A. Barney, Chief, Engineering Division, Department of Public Works, San Diego County; Lowell McLean, President, United Control Inc., El Cajon; and Ernest A. Taylor, Street Superintendent, Oceanside.

The new Chapter was organized because the rapid growth in that area has shown a definite need for standardization among cities and counties relative to installation of utilities and improvement of subdivision streets. The chapter will serve as a common meeting place to discuss interrelated problems and work out sound procedures.

EQUIPMENT MANAGEMENT—THE MILWAUKEE WAY

HARRY R. STIEDEMANN,

Supt., Bureau of Municipal Equipment, Department of Public Works, Milwaukee, Wisconsin

Presented before the First Annual Michigan Public Works Conference sponsored by the Michigan Chapter of the APWA at Michigan State College, East Lansing, Michigan.

THE Bureau of Municipal Equipment in Milwaukee, owns, operates, maintains and services all vehicles necessary to the operation of the Department of Public Works. This includes such bureaus as Street Sanitation, Garbage Collection & Disposal, Street Construction, Electrical Services, Forestry, and other minor divisions. The equipment ranges from small pumps to large cranes, and numbers about 1700 pieces. In addition, we repair and service, on a cost basis, the 150 vehicles in the Police Department fleet.

We rent equipment to the various bureaus, on hourly rates or mileage rates, depending on type. These rates are determined by the previous year's cost records. An individual cost record is kept on each piece of equipment. This is summarized by sizes and types, and rates determined on that basis. We bill the renting department at these rates. These charges must pay for all operating expenses of the Bureau—salaries, wages, materials, parts. There cannot be a deficit, which makes us doubly cost conscious.

Last year we billed about $4 million of service. We have not found it necessary to have any rate increase for the past 3 years, with the exception of one or two specialized units; but this does not apply to equipment operators' rates.

We have three major repair shops: One is confined to the repair of passenger cars, pickup and light trucks; a second to large trucks, sweepers, rollers and other heavy duty equipment; the third is a paint, body and rough work shop. This situation is not ideal; one streamlined, repair shop would be better.

We operate 7 storage garages at various locations where trucks are stored, greased and washed, and minor service given, such as carburetor and brake adjustments. Trucks are parked close to their working locations to reduce time to and from jobs.

Operating in this manner we eliminate the duplication of separate repair shops for the various bureaus, and, naturally, the duplication of stores and additional overhead. We all know that equipment is most economical when used on a full-time basis. This is impossible under the separate equipment deal for each department.

If you are contemplating a separate equipment bureau, get set for a lot of resistance, for often bureau heads feel they are losing some advantage; but they will not be able to dispute the value of an equipment pool, with more uninterrupted service and less time loss due to lack of equipment.

Equipment Pool

All equipment should be listed on a Kardex system for daily equipment shifts. These cards give type, size and department number, driver's name, working department, foreman's name, and parking location. Color of card denotes whether equipment is in repair or available and at what station. The cards are shifted every evening as equipment changes work assignments, location, or driver. All equipment must be assigned through the Dispatcher's Office, and immediately made available to that office upon completion of work.

This Dispatcher's office must be manned by high grade personnel, who have more than a sparring knowledge of all types of equipment and are capable of advising other bureaus as to the type best suited for their work. They should have personnel experience, and full authority for job assignments and for disciplinary or corrective actions in event of operator delinquencies.

Records

Individual cost records, showing repairs to each piece, mileage, and revenue earned by that piece, broken down to cost per mile or per hour are a prime requisite. Records of work performed on units on the last shop appearance should be on printed forms stating various shop operations, requiring only a check mark to denote work done. These are definite time savers as a foreman can turn to a unit number and know what work was done previously without actually checking for that operation.

Mechanics' time sheets should show unit worked on and time for each type of repair; and be initialed or signed by the shop foreman. The mechanic then knows his production is under scrutiny and subject to the foreman's questioning. All operators should be required to turn in a "condition of equipment" form for equipment needing service check at end of day.

Stock Records

A perpetual inventory record is a definite must, with a high and low number based on use experience. When the low mark is reached, stock must be requisitioned. This record has eliminated expensive stock chasing. We adopted a tire record some years ago, showing the original cost of the tire, plus a recap or repair record. We carry no spares for any vehicle except for police cars and a few passenger cars. Each tire is branded and catalogued. Thus a tire might be on 8 or 9 pieces of equipment, but we have an accurate mileage of each tire, which is very valuable when bids are received.

An interesting item we discovered in that respect was that the 5 percent or less miles actually made by trucks on city dumps was responsible for 50 percent of our tire service calls. On that basis, all trucks purchased now come equipped with cut and tear resistant compound. All purchases of truck tires are of that type. In 1953, in spite of increased mileages, our tire calls were 750 fewer than the previous year.

Preventive Maintenance

I cannot stress too strongly the need and necessity of a preventive maintenance program. It pays off.

Many critics of costs of municipal vehicles say that private fleets are worked harder and are subject to more abuse. I dispute this. Garbage trucks going through an alley with their motors turning over slowly and stopping every 40 to 50 feet, are subject to motor trouble due to sludging and oil oxidation caused by this slow movement. A truck showing 50,000 road miles will probably have 150,000 motor miles. Oversize filters do a good job in such an operation. We found that a goal of 6000 miles or six months, whichever comes first, was a good mark to shoot at. On our first round we found that every truck needed major work; the second round considerably less, and the third still better. This check covers brake inspection, carburetor, ignition, regulator, steering columns and transmission. The mechanic also has ac-

(*Continued on page* 144)

Washington news

Presented in cooperation with the American Public Works Association and through the courtesy of the Washington Office of the American Municipal Association.

President Proposes to Remedy Highway Deficiencies

President Dwight D. Eisenhower, through Vice President Nixon proposed a "grand plan for highway construction in the U. S." It is the boldest highway building program ever put forth by an American President. The program envisages creation of an adequate highway system for a population of 200 million costing $50 billion. Vice President Nixon said ". . . our highway network is inadequate locally and obsolete as a national system. Experts say $5 billion a year for 10 years—in addition to current normal expenditures—will pay off in economic growth." Thus, the President envisages a national highway expenditure of around $16 billion a year total because present highway expenditures—Federal, State, local—now total around $6 billion a year. The President's plan revolves around four major points. These are:

1. A grand plan for a properly articulated system that solves the problem of speedy, safe transcontinental travel; inter-city communication; access highways and farm to market movements; and metropolitan area congestion (bottlenecks and parking).

2. A financing proposal based on self-liquidation of each project wherever that is possible—through tolls or the assured increase in gas tax revenues; or on Federal help where the National interest demands it.

3. A cooperative alliance between the Federal Government and the States so that local governments—the most efficient sort of government in the administration of funds—will be the manager of its own area.

4. Very probably, an authority initiated by the Federal Government with State cooperation for the planning and construction of a modern interstate highway system, empowered, for example, to advance funds or guarantee the obligations of localities or States which undertake to construct new or modernize existing highways.

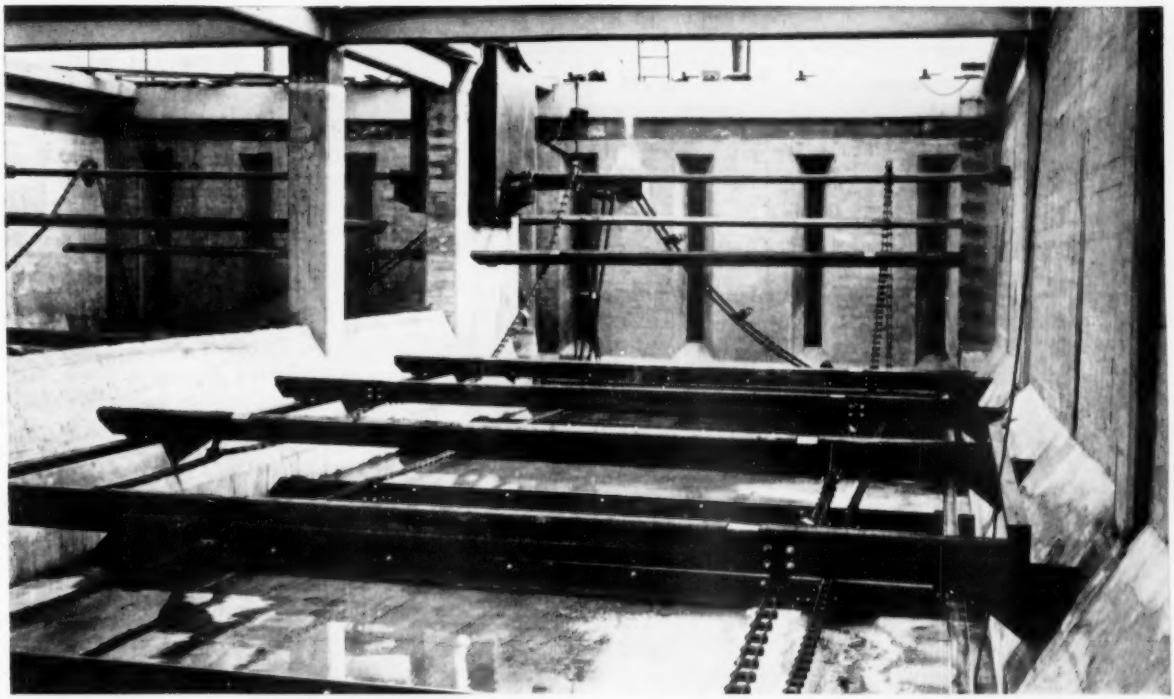
Government Contracts

The Defense Department has revised its procurement regulations so that municipalities may now sell utility services to armed forces installations without a written contract provided the annual cost of such service is not over $2,400 per year. Prior to the rule revision, written contracts to cover any and all agreements for utility services to armed forces post, camps or stations required cutting through the red tape that surrounds defense department written, contractural agreements. The new regulations will speed up and simplify local procedures for selling utility services to the Defense Department. The new regulations went into effect July 1, 1954, and apply to all service agreements entered into after that date.

Fiscal 1956 Federal-Aid Highway Fund Apportionment Moved Up

In an unusual step, Commerce Secretary Sinclair Weeks moved up the Federal-aid highway allotments slated for distribution on January 1, 1955, to July 1, 1954. The six-month speed-up is designed to have a "favorable impact" on the national economy. Practically, it means that an additional $100 million worth of contracts over and above the amounts that would normally be let, would be worked out during the next three months—the heart of the highway construction season. Secretary Weeks said, "As further planning and engineering is completed this year and contracts awarded for procurement and construction, there will be a steady

Michigan City converts to mechanical flocculation and sludge removal



At Michigan City (Ind.) filtration plant, Link-Belt water treatment equipment has been installed in two existing tanks, and one new tank. Longitudinal and cross collectors can be seen in above photo of settling basins. Straightline mixers are installed in each of three flocculation basins. Link-Belt also furnished all drives (below). Consulting engineer: Boyd E. Phelps, Inc., Michigan City, Ind.

LINK-BELT Straightline Collectors abate lake pollution, reduce chemicals used in water treatment

FOLLOWING the trend by municipal filtration plants to reduce chemical dosage costs by mechanical flocculation and sludge collection, Michigan City, Ind., installed a Link-Belt Straightline mixer and sludge collector system. Immediate results included speed-up of collection and removal...elimination of the cost and inconvenience of periodic draining. And because slowly discharged sludge is easily assimilated by the adjacent lake, pollution is no longer a problem.

Link-Belt manufactures a broad line of sanitary engineering equipment—can meet any need from limited to complete modernization of a plant, large or small. Whatever your requirements, our sanitary engineers will be glad to work with your engineers, chemists and consultants—help you get the best in modern water, sewage or industrial liquids treatment.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

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increase in jobs, not only among highway workers but also among those in enterprises supplying road-building equipment and highways and bridge materials." Distribution is as follows: Primary system: $315.5 million; Secondary system: $210 million; Primary system in urban areas: $175 million; National system of interstate highways: $175 million.

BOOKS IN BRIEF

SYMPOSIUM ON WATER POLLUTION

The proceedings of the Third Annual Water Symposium on Water Pollution held at Louisiana State University, Dec. 14-15, 1953, are contained in Bulletin 43. This covers biological indices of pollution, other water pollution problems, and sugar refinery waste problems. 46 pages. Copies can be obtained free from Engineering Experiment Station, Louisiana State University, Baton Rouge 3, La.

THE FLOOD CONTROL CONTROVERSY

An excellent presentation of the facts about flood control, the claims of the Corps of Engineers and of the Bureau of Reclamation for their respective programs; some cost data; some searching questions; and lots of excellent and enlightening reading. Programs are not criticized but much information about them is given. Should be required reading by all engineers and executives in the flood areas—in fact, in all areas, because most everyone pays for these flood control programs. Local contributions are very small. By L. B. Leopold and Thomas Maddock, Jr., Ronald Press Co., 15 East 26th St., New York, N. Y. $5.

MAPPING THE KANSAS TURNPIKE

An interesting reprint, describing the methods and equipment used for air-mapping the Kansas Turnpike is available from Jack Ammann Photo-Grammetric Engineers, Broadway at Tenth St., San Antonio 5, Texas. This is a reprint from the Kansas Business Magazine, 4 pp.; no charge.

AIR POLLUTION CONTROL

The Air Pollution Abatement Manual presents up-to-date information on research and on operational practices related to this subject. There are 11 chapters, a preface and outline and a chapter on Terminology and Selected Data. C. A. Gosline of DuPont was editor. Single complimentary copies of the full manual will be sent to federal, state and municipal officials directly charged with air pollution responsibilities. For others the price is $6. Write to Manufacturing Chemists' Ass'n., Inc., 1625 Eye St., NW, Washington 6, D. C.

ELECTRIC POWER TRANSMISSION

This is a very complete text on the steady operation of transmission lines and power systems, as well as on the methods available for the study of such operation. It is intended for undergraduate or graduate instruction work, and as a reference text for practicing engineers. In order to provide a proper approach, a fairly extensive introduction (about 60 pages) is provided dealing with the basic structure of power system. The authors are Professors John Zaborsky and Joseph W. Rittenhouse, both of the University of Missouri, Rolla. The Ronald Press Co., 15 East 26th St., New York 10. 670 pages; $12.50.

HYDRO POWER ENGINEERING

This book, though designed to meet the requirements of a one-semester or quarter course for college students, supplies a very practical approach to the design and preparation of plans for hydro-electric installations—as would be expected from any book written by this accomplished and able author. There are 200 pages, eight chapters covering the fundamentals of water power study, analyses of data, hydraulic turbines, dimensions of water passages and power houses, appurtenances, economic aspects of hydro-electric development, and hydro-steam association. By James J. Doland of the University of Illinois; the Ronald Press Co., 15 East 26th St., New York 10, N. Y.; $7.50.

PARKING AS A FACTOR IN BUSINESS

This is the fifth of a series and is devoted to trends in economic activity and transportation in the San Francisco Bay area. The effect of parking is studied from all angles. 321 pages, letter size, paper cover, available from the Highway Research Board, 2101 Constitution Ave., Washington, D. C., at a cost of $2.10.

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A billion-mile network of buried faith lies stretched across America. It's Vitrified Clay Pipe — the product that disappears underground . . . and *has* to be trusted. Clay Pipe is sealed in by streets and sidewalks . . . blocked off by building foundations . . . piled over with earth and rock.

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● STEEL slides assure safety from slivers and give lots of fun.

Factors in Selection, Installation, Maintenance and Safety of PLAYGROUND EQUIPMENT

NORMAN R. MILLER
Vice President,
American Playground Device Co.

There are four important points to keep in mind in establishing and operating a playground apparatus area: The playground devices should be properly selected for size and design, correctly installed, well-maintained, and safe.

Now, let us begin with the selection of the right equipment for the playground. In early childhood, the larger muscles of the trunk, legs and arms are more developed than the smaller muscles of the hands and feet. At this stage, boys and girls need, besides running and jumping activities, the kind of exercise that is well supplied by climbing structures, such as the Castle Tower or Castle Walk.

Four basic units of playground equipment, in the order of their importance and popularity, are: Swings, slides, climbing structures and see-saws. Horizontal ladders, parallel bars and trapeze bars are fine for older children, particularly those who have reached the awkward stage. Exercise on the ladders and bars will develop skill and coordination.

Children play better, and with greater safety and beneficial results, if they play with youngsters of their own age group. For this reason, it is strongly advised that three separate apparatus areas be established —the primary, for children 2 to 6 years of age; junior, 6 to 10; and the senior, 10 and over.

The apparatus units should be sized as shown in Table I for the primary, junior and senior areas: Other equipment that can be added to make the playground of more interest includes merry-go-rounds, ocean waves, and giant strides.

Installation of Equipment

Proper installation of playground apparatus will reduce maintenance costs; and is essential to playground safety.

Alinement of all frame members is necessary to assure the best appearance and maximum structural strength. While the concrete is still wet and the fittings loose, a level should be used to make sure that top beams are level and straight and vertical supports are perpendicular to the ground. After alinement, the fittings can be pulled down tightly and the concrete allowed to harden. No apparatus should be attached to the frames nor any playground unit be placed in use until the concrete footings have cured for at least 48 hours; and it is better to wait for 72 hours.

Concrete around the base of all frame support members should be troweled smooth and shaped conically so that it is highest at the pipe members proper. It is recommended that at least four inches of turf cover all concrete footings, level with the ground line. For an extra measure of safety, the turf could be covered with tanbark, sawdust or shavings to cushion possible falls from the equipment.

Timely repairing and repainting of playground equipment will make it last longer and increase child safety. A regular maintenance program should be continued throughout the year. Badly worn, splintery or cracked slide siderails, swing seats, see-saw boards and other wood parts of apparatus are dangerous and should be repaired or replaced promptly. Swing chains, hooks, hangers and frame fittings should also be checked carefully.

Worn slide chutes present a special problem. Few have the tools and equipment to do a proper job of slide chute repair or rebuilding. It is usually advisable to ship the worn chutes to the factory for rebuilding or to replace them with new chutes of all-steel construction.

Years of extra service can be added to playground equipment by painting it frequently and regularly. Outdoor enamel is very good on wood parts. The protective coating will last longer and look much better if the wood parts are sanded reasonably smooth before they are refinished.

Table I—Sizing of Playground Apparatus

Equipment Item	*Primary 2-6 yrs.*	*Junior 6-10 yrs.*	*Senior Over 10 yrs.*
Swings, height	7 to 8 ft.	10 ft.	12 to 14 ft.
Slides, height	5 to 6 ft.	8 ft.	10 to 15 ft.
Length	10 to 12 ft.	16 ft.	20 to 30 ft.
Climbing Structures:			
Height	7 ft.	7 ft. 9 ins.	9 ft. 9 ins.
See-Saws, length	.....	10 ft.	12 ft.
Broad width	.....	10 ins.	12 ins.
Hor. Ladders, height	.....	6 ft.	7 ft. 6 ins.
Length	.....	12 ft.	18 ft.
Trapese Bars, height	.....	.....	5 ft.
Length	.....	.....	10 ft.

Playground Safety

And, after you have carefully selected, installed and maintained safe playground equipment, it is well to supervise the area to assure additional safety. Carelessly placed bicycles are a hazard on the playground. Bicycle racks, made of steel pipe, are best for the orderly parking of the wheels.

Safety rules should be posted conspicuously in the immediate vi-

cinity of the playground apparatus. Here are suggestion for points to be covered:

Swings: Don't stand or kneel on swings. Don't climb on frames. Don't jump off swing while still in motion. Don't stand near swings in motion. Don't swing crookedly. Don't hold a smaller child on your lap while swinging. (Some accidents are caused by swing seats hitting the bystander; a rubber-encased swing seat assures extra safety.)

Slides: Don't overcrowd platform. Only one child should slide at one time. Don't slide backwards. Don't crawl or run up the slide. Avoid horseplay.

Climbing Structures: Don't play tricks. Don't step on hands or feet of other children. Hold on carefully. Playing tag, jumping up and down and other show-off antics may cause bad falls.

See-Saw: Give warning to person on other end before getting off. Hold on to board tightly when getting off and let it rise gradually so the child on the other end may get off safely. Keep a firm hold. Sit facing each other, and don't bump end of board on the ground. Sit only—don't stand—on the board. Only two should sit on see-saw board at one time.

Filler Handling in Bituminous Mixing Plants

In the preparation of bituminous concrete, a fine mineral powder often is added as filler. In most mixing plants, filler is discharged by gravity from the manually operated gate of a storage bin into a weigh hopper, but powder which is fine enough to serve as filler does not flow steadily from a bin. The flow may be completely stopped by "arching"; then an arch may collapse suddenly, causing an excessive weight to be discharged before the gate can be closed. Remedial measures in common use, such as hand rapping, and the use of pneumatic and electric vibrators, free the worst stoppages but do not insure regular flow. Much of the capacity of the storage bin may be rendered useless if the filler is so consolidated that it cannot be dislodged by any of these methods.

In the industries which handle powder in bulk, aeration by large volumes of low-pressure air, introduced through canvas, is widely used to maintain the flow of cement and other mineral powders. In Highway Research Abstracts, experiments in the use of low-pressure air in the small quantities that would be practicable on a mixing plant without excessive power consumption or aggravation of the dust nuisance were described.

The main conclusions drawn from the tests were as follows: (1) Vibration of a filler hopper bin may serve to release stoppages of flow caused by arching, but does not entirely prevent arching or insure even flow. (2) Low-pressure air introduced at suitably distributed points, particularly along the corners where converging inclined plates meet, can maintain an adequate and reasonably uniform flow. (3) The air is more-effectively distributed through canvas-covered panels than through jets. Pipes with apertures covered by canvas are also effective. (4) The canvas should be of sufficiently close weave or of small exposed areas to limit the flow of air independently of the weight of filler on it. (5) Air consumption need not be more than ¼ cu. ft. per min. per ft. of length of panel or pipe. The air need flow only when the gate is open. (6) The use of low-pressure air need bring no noticeable increase in dust.

The Status Of Civil Defense in St. Louis

(*Continued from page* 109)

little warning. Only in the event of the near-total devastation would such a municipal civil defense corps be nearly helpless. In any case, the basic structure developed in St. Louis is continuing to be maintained and expanded insofar as possible. A summary of the Civil Defense Corps, and its present manpower status, follows. In the tabulation below, (1) is the responsible directing organization; (2) are the duties; (3) are the manpower needs; and (4) the enrollment as of March 1, 1954.

Headquarters (1) OCD; (2) general control of operations; (3) 310; (4) 310. *Police and Warden Service*: (1) St. Louis P.D.; (2) sector Control, traffic control, law and order and block wardens; (3) 25,000; (4) 3,512. *Fire*: (1) St. Louis FD; (2) fire fighting; (3) 3,000; (4) 1,164. *Health*: (1) Public Welfare Dept., Health Commissioner; (2) all health measures; (3) 919; (4) 410. *Medical*: (1) Pub. Welfare Dept., Hospital Com'r; (2) first aid, clearing stations and base hospitals; (3) 40,459; (4) 13,917. *Mortuary*: (1) City Coroner; (2) care of the dead; (3) 1,573; (4) 103. *Radiological Defense*: (1) Physic Depts., St. Louis and Washington Universities; (2) all radioactive determinations; (3) 72; (4) 51. *Civil aviation*: (1) CAP, Sq. 2, USCG; (2) reconnaissance, transportation, message transmission; (3) 159; (4) 53. *Rescue Service*: (1) AGC; (2) clearance of streets, demolition and repair; (3) 6,257; (4) 6,257. *Emergency Relief*: (1) Red Cross; (2) food, clothing, shelter, feeding; (3) 5,000; (4) 785. *Transportation*: (1) St. Louis Pub. Serv. Co.; (2) provide and operate transportation; (3) 11,884; (4) 3,515. *Emergency Welfare*: (1) So cial Planning Council; (2) registration, casualty lists, assistance to needy; (3) 4,909; (4) 886. *Utilities*: (1) Dept. of Pub. Utilities; (2) water, light, heat, power; (3) 5,000; (4) 4,656. *Streets and sewers*: (1) Dept. of Streets and Sewers; (2) repair and maintain streets and sewers, traffic control, refuse collection; (3) 1,277; (4) 1,277. *Communications*: (1) Telephone Co.; (2) all emergency communications; (3) 6,000; (4) 4,245. *Plant Protection*: (1) Chamber of Commerce; (2) creating Civil Defense organizations in all classes of facilities; (3) 10,000; (4) 600.

The total manpower needed, according to this plan is 121,819 of which 41,741 were enrolled as of March 1 of this year.

This Civil Defense Corps, at least in its higher echelons, was put to a test—its second since its creation—in its participation in the June nationwide civil defense exercise sponsored by the FCDA. This was primarily a test of control center operations and communications, with no public participation in the exercise in the St. Louis area. Framework for the exercise, locally as well as nationally, was prescribed by the FCDA.

The major part of the exercise consisted of the setting up of the Primary Civil Defense Control Center, and of the control centers of the various civil defense services. This was followed throughout the exercise by the transmission of messages among these and other appropriate facilities, based upon the hypothetical situations resulting from the attack. There was some token movement of actual forces, particularly by the Police, Fire, Medical, and Welfare and Relief Services, and some movement as between the City and the County. In the main, however, the exercise was a "paper" one at all levels. Though still too early to evaluate it completely, enough evidence is now available to indicate that it was effective. Some bottlenecks in communication were revealed. Most especially the use of short wave radio contact with the State Civil Defense Agency in Jefferson City showed several technical faults. Teletype, telephone, and "walkie-talkie", as well as amateur radio operation on a local basis, proved very successful. During the twenty four hours of the drill, 625 messages were handled in the Primary Control Center.

One other main element in the planning was discovered as a result of this test. On the basis of local assumptions, it was calculated that the attack of June 14 caused about 93,000 injuries, half of which required hospitalization. A check reveals that hospital facilities available in this area are lacking for about 15,000 of these casualties. The only practical solution now appears more than ever to be the development of a more effective dispersal plan. Only by this means can the number of casualties be reduced to manageable proportions.

With this exception, and the few weaknesses displayed in the communications system, the test showed that St. Louis has a going civil defense organization, capable of effective operation in the event of enemy attack. Moreover, this is now true not only of the city but of greater St. Louis as a metropolitan area with over one and a half million population.

Metropolitan Aspects of Civil Defense

The St. Louis Metropolitan Area, which obviously must be considered in many respects as a unit for civil defense purposes, typifies practically all of the problems involved in any such community anywhere. It includes nearly every known unit of government from the regional to the township level, and even below. There are, in fact, over 750 taxing units in the area.

Despite this great proliferation of public jurisdictions, there is no one unit of government in the area with responsibility for civil defense. St. Louis City, of course, has developed its own organization; St. Louis County has also established a civil defense office; within the county, many of the 94 municipalities have also made progress. On the Illinois side of the Mississippi, the situation is much the same; some counties and cities have done much; others have done little or nothing. An additional complication, with respect to these communities results from an opinion by the Illinois Attorney General that mutual aid agreements on an interstate basis are not permitted under Illinois law.

So far as the Missouri portion of the St. Louis Metropolitan Area is concerned, there is full statutory authorization for the negotiation of mutual aid pacts. The Missouri Civil Defense Act permits the executive officer of any political subdivision of the State, with approval by the Governor, and consistent with state plans and programs, to enter into mutual aid arrangements or agreements with other public and private agencies, "within and without the State," for reciprocal civil defense aid. Despite this legislative authorization, no mutual aid pacts have thus far been negotiated by St. Louis, with any of its neighboring communities. Several exploratory efforts in this direction have been undertaken; and drafts of mutual aid pacts have been prepared by the St. Louis Office of Civil Defense, and submitted to adjacent civil defense offices for comment and correction. Nevertheless, to date (July, 1954), these preliminary efforts have not proved successful in the field of mutual aid.

The picture should not, however, be painted solely in sombre colors. On an informal, extra-legal basis, considerable coordination and cooperation has been developed within the metropolitan area. An outstanding example of such coordination of effort is that concerned with civil defense in the schools. Two projects have been completed, involving the city school system, the 33 county school systems, and all Catholic and Lutheran Parochial schools in both city and county. One of these projects was the development of materials for use by school authorities for the shelter and protection of the school population. The other was the preparation of uniform curriculum materials on civil defense, for use in all school programs. There are other examples of the same sort of coordination: for example, the City of University City, in St. Louis County, built its public warning system on the same specifications and standards as did the City of St. Louis. Moreover, the same municipality coordinated its various tests, culminating in the public test of January 16, 1954, with St. Louis. There has also been some coordination as regards the recruitment and training of auxiliary police, standardization of firefighting equipment, and the like. As indicated above, agreement has also been reached concerning the development of a new area-wide dispersal plan, and the June test revealed excellent possibilities of coordination and cooperation. However, much more remains to be done before metropolitan St. Louis can claim an adequate over-all organization for civil defense.

Diluted Emulsion Surface Seals for Highways

MANY of us have wished, says the Texas Highway Department in its publication "Texas Highways," for some easy way of adding a little asphalt to improve, or prevent deterioration of, an existing pavement. Diluted emulsion seals have been used in District 8, J. C. Roberts, District Engineer, and District 7, T. J. Kelly, District Engineer, and are being observed to determine their merits in preventing aggregate stripping and possibly in sealing hair cracks. Here are the reports from the two districts.

District 8, J. C. Roberts

Two summers ago, we borrowed an idea from the Maintenance Department of the City of Austin which involves the use of a mixture of HVMS asphalt emulsion and water applied to dusty streets as a dust palliative. This procedure was brought to our attention by B. B. Freeborough.

Our first experience was in Jones County on F. M. 1233. We applied a mixture of emulsion and water on the raw base under traffic. This proved to be an excellent substitute for the usual MC-1 prime which we have used in the past. Since this experimental job, we have eliminated the use of MC-1 as a prime on bases and have provided for the water and emulsion treatment to all new bases in the district.

Our experience with the mixture of water and emulsion on bases in lieu of the MC-1 prime indicated to us that the same treatment might be applicable to old surfaces which have shown a tendency to ravel and hair crack. Of course, the raveling condition and the hair cracking condition can be caused by a lack of asphalt in the initial application or a lack of traffic on the surface to make the asphalt react properly during the summer weather. The idea of applying emulsion and water mixture on the existing surfaces was tried first on F. M. 618 in Haskell County in September, 1953. This pavement showed every indication that we misjudged its condition previously and that it needed to be sealed immediately. A total application of approximately 0.06 gal. of residual asphalt was applied on this surface in one application of the water and emulsion mixture. This amount appeared to be too heavy for one application and by increasing the speed of the trucks, we found that it was an improvement for each pass with the water trucks to leave approximately 0.02 gal. of residual asphalt per square yard. Of course, as many applications may be made as field conditions deem necessary. The visual results of this treatment were to us most gratifying. Beyond a doubt the raveling of the aggregate was immediately stopped and there is no doubt that the hair cracks in the pavement were filled with the residual asphalt.

It is my opinion that this type of treatment applied as often as necessary on any road on which there is no danger of causing a slick surface can delay the need of a seal coat indefinitely. Because of the very small quantity of residual asphalt used in this work, it is our opinion that the danger of causing a slick surface is very slight on the roads we have treated. Our experience shows that 15 percent mixture of emulsion and water gives the results we desire.

The equipment used on work of this kind consists of 1,000-gallon water tanks with three- inch round spray bars eight feet long. The openings in the spray bars are one-half inch on eight-inch centers. Attached to the spray bars are one and one-half inch by one and one-half inch flat irons about one-half inch under the openings, which are used as "splatter boards" to spread the mixture more evenly during the application.

Since the early fall was have treated approximately 90 miles of single asphalt surface in the district in this manner. In each case the single asphalt surface consists of 0.04 gal. of OA 135 and a Grade 3 cover stone.

The cost of work of this type is variable and depends largely upon the distance that water must be hauled. Our records indicate that the average cost per single application varies from $30 to $40 a mile. We have found that in some cases as many as four applications are needed to secure the desired results.

District 7, T. J. Kelly

Most emulsified asphalts can be readily diluted with water. This quality permits wide variation in the amount of dilution, allowing uniform application of very thin films of asphalt. This characteristic, which is peculiar to emulsified asphalt, has many evident usages. However, this discussion is being confined to its use for the rejuvenation of existing dry asphalt surfaces without resorting to the greater expense of customary "seals" for the same purpose.

In this district it is usual practice to place the emulsion in an ordinary water truck, then to add the water, depending upon the addition of the water and the motion of the truck to do the mixing. The sprinkler bars are equipped with larger holes and splatter plates to obtain more uniform distribution. We have found that with our sprinkler trucks, equipped with eight-foot spray bars, driving about twelve miles per hour,

1 Yd. Jaeger Load-Plus working between tracks and stockpile

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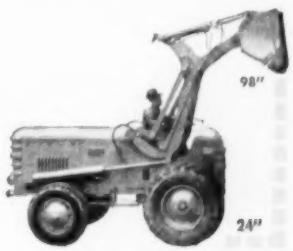

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and using a mixture of 10 percent emulsified asphalt, approximately 0.02 gallon of asphalt is applied per square yard.

Using a mixture of 15 percent emulsified asphalt, we obtain approximately 0.03 gal. of asphalt per square yard. Of course it is necessary to vary the speed as the tank empties to insure uniformity in application. It is of prime importance in this method that each application be a thin film, regardless of the accumulative total to be applied. It is desirable that each application be allowed to break and cure completely before succeeding applications are made. In any event, traffic should be kept off the treated surface until there is no longer danger of the asphalt film being picked up. This will be probably 30 minutes to one hour. Applying the mixture in half widths is very helpful in providing for traffic.

This method was first used experimentally in this district in the summer of 1952 on a penetration-type surface which was showing some tendency to ravel in spots. The results obtained were very satisfactory, and the use of the method was increased. It has been observed that the thin asphalt film is soon worn off the top of the exposed aggregate, and thus the original color of the pavement is restored within a month or so. The size of areas to be treated can be varied as desired, as the mixture can be applied with an ordinary sprinkling can.

• • •

Refuse Disposal Services Provided by San Diego Co.

THE San Diego Co., Calif., Department of Public Works, of which Jean L. Vincenz is the director, is responsible for the maintenance and operation of the County's 21 refuse disposal sites for the convenience of the public in the unincorporated, as well as the incorporated, areas. One additional dump—at Campo—was established during the past year to serve 350 to 400 people. Regular inspection and scheduling. of operations resulted in considerable improvement in the condition of these disposal areas.

There are several arrangements by which the County operates and maintains these facilities. Regular classified County employees act as full-time caretakers at two of the sites. Four of the sites have no regularly-assigned personnel but are

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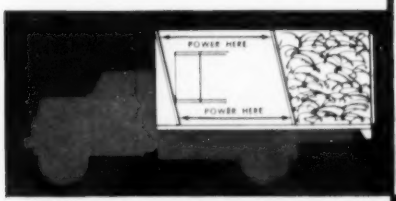

Each cycle of the M-B Packer plate provides complete, even compaction—insuring maximum load per cubic yard of capacity and more blocks of pick-up coverage per load. Power is applied to the plate at the top and bottom, simultaneously.

handles big loads on a small truck

M-B Packers handle full 12-14-16 cubic yards of compacted refuse and yet you need only a 1½ to 2 ton capacity truck!

You can purchase *two* M-B Packers for the cost of *one* highly complicated competitive unit.

You get the most for your money with an M-B. • M-B Packers are easy and safe to load from either side. • M-B takes less men per truck than other methods of collection. • M-B handles large wooden crates and boxes through its rear doors — material that would ordinarily be left by other bodies. • M-B Packers have racks on top to handle bed springs, mattresses and other odd-shaped refuse. • M-B Packer plate completely compacts 2 cubic yards of loose garbage at a cycle. • M-B unloads itself by ejecting load out the rear — fast and safely — without danger of upending. • M-B mounts on popular, low-cost, light weight trucks of 16,000# G.V.W. with standard 102" cab-to-axle length. • You can use the M-B Packer as a general purpose truck when you desire.

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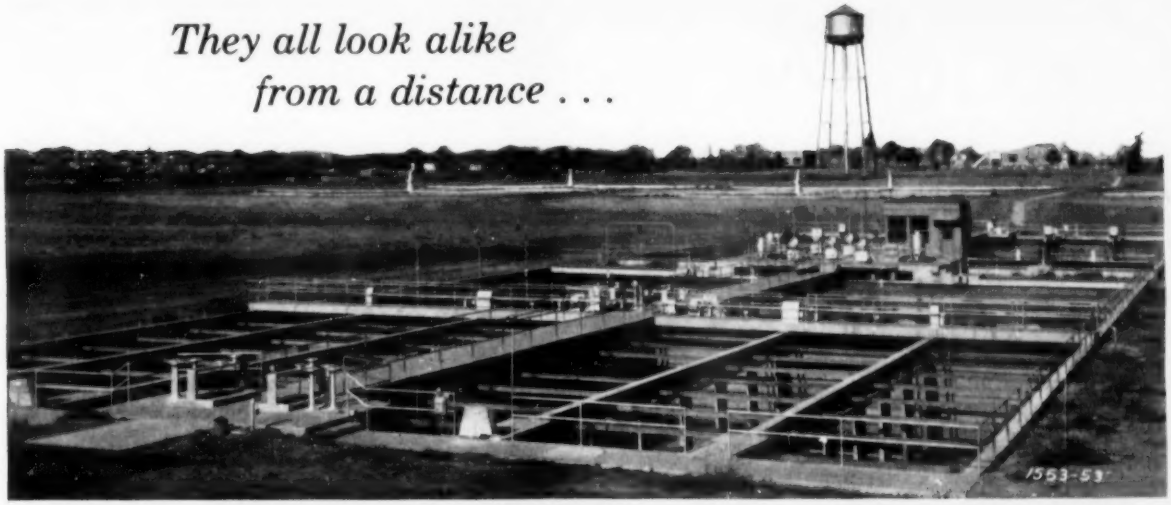
cared for as needed by men from the department's labor pool. Limited maintenance is given 11 of the sites and caretaker services are provided by contract which permits salvage. At the site near Coronado, there is an agreement with that city for all services. The County provides little, if any, services at the remaining three sites which are operated by full-time private caretakers who have salvage rights. At all sites except the last four, the County maintains fire breaks and roads and supplies cover material as required. Approximately 10,500 man-days were spent by County and contractor forces in preparing, operating, and maintaining the County refuse disposal sites.

The major portion of the heavy equipment work of the Sanitation and Equipment Section of the Public Works Department was concerned with various activities at these disposal sites. Four pieces of heavy equipment are regularly assigned to this type of work, including three crawler-type tractors and one truck and trailer on which the tractors are transported. When scheduling permits, this equipment is used on other types of projects such as park maintenance, preparation and cleaning of drainage ditches, preparation of building sites, removal of trees, and various other jobs requiring earth-moving equipment.

In addition to furnishing refuse disposal sites for the convenience of the public, the department also supervises the collection and disposal of all refuse in the unincorporated areas of the County as well as the disposal of refuse from four incorporated cities not having municipal disposal services. Applications for transporting garbage and rubbish also are received by the department; investigations are made to determine whether trucks are suitably constructed and properly equipped to perform in a satisfactory manner; and recommendations are made to the Board of Supervisors for the issuance or denial of these permits. Investigations are made to see that containers of proper size and weight and equipped with covers are used, and that these containers are properly cleaned. Checks are made on unauthorized dumping of refuse along public highways. Investigations are also made relative to unsanitary conditions caused by retention or improper handling of garbage at the point of origin, while being transported, or at the ultimate disposal site.

They all look alike
from a distance . . .



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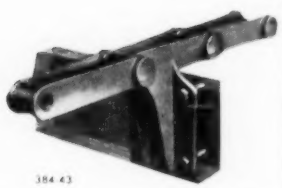
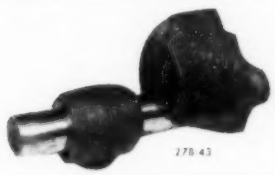


Full Depth flight attachments to prevent splitting of flights.



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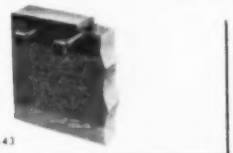

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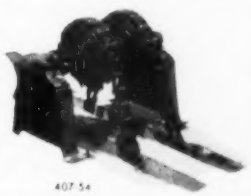

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Split offset driving Sprocket . . . Easily replaceable . . . Bearing mounted against wall.

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Reinforcing Asphaltic Concrete With ROLLED WIRE FABRIC

A NEW technique for reinforcing asphaltic concrete has been developed by the Texas Highway Department's Beaumont District using welded wire fabric in rolls, rather than in sheets. This work was done on a five-mile section between Beaumont and Port Arthur. Prior to this, except for small jobs, rolls of fabric had not been employed successfully in reinforcing bituminous resurfacing over long stretches.

The existing 20-foot portland cement concrete pavement was first widened to 24 feet. Across the entire width, a leveling course about one inch thick was machine-laid using 100 pounds per square yard of Texas Type E, sheet asphalt. The fabric, 6x6-10/10, was laid directly on the leveling course, which was tack-coated, and, using an Adnun finisher, covered with three courses of hot mix, Texas Type D, totaling 290 pounds per square yard, and aggregating three inches in thickness. Tack coating was used between each course of the hot mix.

Trotti and Thomson, Inc., Beaumont contractors, devised their own roll-handling procedures on the job. At the start of the operation, the end of the first 300-foot long, 11½-foot wide roll of fabric was interlaced with a ⅜-inch round rod. This rod was then dropped behind four or five short steel pegs which had been drilled into the existing portland cement concrete pavement on a line transversely across the lane. Next, the fabric was unrolled its entire length and straightened out on the pavement by tension.

This was accomplished by a job-rigged tensioning device which consisted essentially of three lengths of chain and a 9-foot length of pipe, assembled to form a bisected triangle. Along the pipe, which formed the base of the triangular device, seven hooks were spaced equi-distant. With these hooks caught over a rod interlaced across the end of the roll of fabric, tension was applied manually to the apex of the triangle, transmitted down the three chain lengths to the rod and hooks, and thus through the width and length of the fabric. This tension (which was slight and only sufficient to keep the fabric flat) was maintained by the rod, anchored to the pavement at the far end, and by securing the tensioning device to the pavement at the near end.

Having devised this means of keeping the fabric flat on the pavement, the contractors felt that the use of steel plates, sleds, or "hold-down" devices would be unnecessary.

After paving the first quarter of a mile of the project, however, it was found that some springy areas developed under traffic, caused by localized waviness and bulges of the fabric which occurred despite the roll-tensioning device. It was necessary to go back over the section paved and clip some of the wires in order to reduce this springiness.

Accordingly, the Beaumont District engineers and the contractors concluded that some sort of hold-down device was needed, after all, to minimize the effect of localized bulges in the fabric. A steel plate 12 feet long, four or five inches wide, and about an inch thick, was suspended by chains, transversely under the Adnun paver just ahead of the spreader. This plate, beveled on the front and ends, slid along the fabric and "ironed" out the bumps and waviness which had caused the difficulty in the first quarter-mile.

Still another tool was devised to eliminate any persistent bulges in the fabric. This was a short length of pipe, notched in one end and bent into a handle at the other end. A worker, noting a wavy section of the fabric, merely dropped the notched end of the pipe over the wires, twisted the handle, and "crimped" away the bulges; the fabric then dropped flat.

After this sort of ready improvisation, the remainder of the five miles of resurfacing progressed smoothly. Rolls of fabric were joined by interlacing a ⅜-inch round rod through the lapped ends of the rolls and twisting the overhanging longitudinal wires out of the way.

The contractor's bid price for placing the fabric in rolls was 22 cents a square yard, including his material costs, handling, insurance, equipment, and return. The U. S. 69-96 job, completed in February 1954, was under the supervision of Urban Engineer E. R. Young. W. E. Simmons is Beaumont District Engineer.

Attachments for the finisher have also been developed by the Colorado State Highway Department, Walter Harris, Maintenance Engineer. These are designed to prevent the fabric, which is laid on the existing road surface ahead of the paver, from becoming caught up or entangled in the paver. The attachments or "hold-down" devices for the paver consisted of three component parts. A quarter-inch thick steel plate, about a foot wide and two feet long, bent into a V-shape, was attached to the paver by pin and hinge, horizontally along the free end of one leg of the V, just outside of each cat track, and immediately ahead of the conveyor screw. With the apex of the V pointing forward, the trailing end of the bottom leg of the V-shaped plate slid along the wires of the fabric, directly in front of the conveyor screw. A heavy coil spring, attached between a bracket welded to the apex of the V and the conveyor screw housing, exerted tension on the upper leg. This torque about the hinged upper leg caused the *bottom* leg of the plate to exert downward pressure on the fabric and thus prevent it from rising and hanging up in the conveyor screw.

With these V-shaped devices holding down the welded wire fabric outside of the cat tracks, a third device was developed to flatten the reinforcement between the cat tracks. To the underside at the front of the asphalt finisher, was attached a ten-foot long steel plate which extended between the tracks back to the conveyor screw. This plate was T-shaped with the wide end, or cross bar of the T trailing along the fabric, just ahead of the conveyor screw. Pressure was applied to this cross bar by means of a compression spring between it and the underside of the Barber-Greene. This downward pressure, as with the V-shaped devices, prevented the steel fabric from entangling in the conveyor screw.

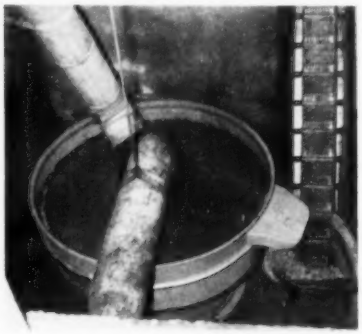
On a 4000-sq. yd. resurfacing project, opposite the newly selected site for the Air Force Academy, the improved hold-down devices completely eliminated "hanging up" or entanglement of the fabric. The reinforcement was welded wire fabric style 3x6-10/10, in sheets 11½ feet wide by 8 feet long. The hot mix asphaltic concrete was laid over the fabric in one 2-inch thick surface course. The cost of placing the fabric from a stockpile on the project, including trucking and labor, was less than two cents a square yard.

Now's the time to mail this month's Readers' Service card.

Vibrating Screen Separator Treats Cannery Wastes

THE Caro, Mich., plant of the W. N. Clark Co., was collecting all waste materials from their canning and packing operation in a pit by allowing the water to drain through a ⅛-inch stationary screen. Because of the size of mesh of this screen, a considerable amount of waste solids from plant operations in packing peas, string beans and lima beans, was being carried with the drain water into the village sewer lines. The village did not have adequate waste treatment facilities and some solids were going into a nearby river, causing pollution.

To correct this pollution problem, the company installed a Model B-1D "Sweco" Separator, 48 ins. in diameter, with a 100-mesh screen, all waste water and solids passing to this vibrating screen. (This includes waste from washers and cleaners, graders, blanchers, fillers and seamers as well as all floor waste.) After screening, the liquid empties directly into the village sewer lines, and the solids into a bucket elevator which carries the waste material to an elevated collecting hopper. Later, during a pea pack, it was decided to use a 50-mesh screen and this has been satisfactory.



● **SCREEN** *treats cannery wastes at Caro, Mich., packing plant.*

Normal capacities are 8,000 to 12,000 gallons per hour. Approximately 400 to 600 pounds of solids per hour are removed. This is obtained on a 50-mesh stainless steel cloth with 0.0145 opening, 0.0055 diameter wire and 52.6% open area. The W. N. Clark Co. reports to the Editor that: "Considering the simplicity of installing this equipment, the efficiency of its operation and the minimum of replacement parts required, we think it is the best on the market today."

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Floodlights and Underwater Lights for Swimming Pools

THREE swimming pools in Montreal's municipal recreation area now have adequate lighting. The diving pool is 25 meters square with a maximum depth of 13.5 ft. There are two racing pools, each 50 meters long and 25 meters wide. All pools are lighted with Crouse-Hinds under-water pool lights, with centerlines 24 ins. below water level. Also, Crouse-Hinds sports floodlights, with 750-watt lights, are mounted on tapered steel poles 30 ft. high. Each pole has three floodlights; and additional units are mounted on the bathhouse roof. Total overhead lighting load is 43,250 watts; total underwater load is 47,000 watts.

● **TENNANT** *Sweeper cleans 48" path; replaces 3 to 12-man crew.*

New Compact Machine Sweeps Gutters Walks and Alleys at 1/5 Usual Cost

BY SWEEPING congested areas with a new type power sweeper instead of pushbrooms, Akron, Cleveland and several other cities may save up to 80% this year in labor costs.

The new sweeper, shown at the APWA meeting in New Orleans last fall, is a compact heavy-duty machine. It cleans a 48" path and turns easily in a 5-ft. radius.

Its sweeping capacity is reported to equal that of a 3 to 12-man pushbroom crew.

Sweeps Cleaner Than a Crew

The sweeper has a powerful brush-and-vacuum system which eliminates need for water spraying or "wetting down." A rotating curb-brush sweeps leaves, dust and litter into main path of the machine.

A 36" brush, in a vacuumized compartment, throws dirt forward into an enclosed 9 cu. ft. hopper. Sweeping speed, with 2-speed transmission, is 1½ to 8 MPH.

Pays For Itself In 6 Months

The new sweeper has proved most successful in "mechanizing" whitewing work in special congested areas where big sweepers can't be used—such as gutters in downtown areas, walks, alleys, garages, driveways, etc.

In such areas a single machine is said to pay for itself in 1 to 6 months.

Air terminals, auditoriums, piers and parking lots also can be swept most economically this way.

For details, please write or wire to the G. H. TENNANT CO., 2578 N. 2nd St., Minneapolis 11, Minnesota.

How To Get Better Bids for Constructing Storm and Sanitary Sewers

WAYNE HIBBS,
Engineer, Gjellefald Associates, Forest City, Iowa

This is a portion of a paper presented by Mr. Hibbs at the Conference of City Engineers and Public Works Officials, held last spring at Iowa State College, Ames, Iowa.

An old carpenter foreman, telling off a couple of young pipe layers, said: "A pipe layer doesn't have to know anything. The Engineer shows him where to lay the first pipe and all he has to do after that is to keep on adding another one." Sewer construction really isn't quite that simple, for it involves a degree of cooperation between engineers and contractors, if the best possible in bids and in construction are to be obtained.

I. Size of Project—First of all the size of the project has considerable to do with the prices you will receive. Two or three small jobs bid separately will cost more than one project which includes the entire amount. Most of these small jobs are not so urgent but that you can wait to combine them into one project of a reasonable size. The contractor can then spread his cost of moving in his equipment and getting set up on the job over a larger amount of work. You also will attract more Contractors for the bidding.

II. Plans—The plans you issue have a great deal to do with the kind of bids you receive. They must be accurate, clear, readily understandable, uncluttered, and show exactly where the sewer is to be located and the depth at which it is to be laid. They should show, in as much detail as possible, any underground obstructions, such as gas mains, watermains, underground cables. Also pavement, curb and gutter, etc.

A set of plans with which the Contractor can visit the location and determine exactly before bidding what will be encountered will remove a lot of doubts from his mind and enable him to put a more exact price on the work.

Another thing—many plans fail to contain a general plan or layout showing the location of the entire project. There will be sheets and sheets of detailed plans and profiles but nothing tying them together. This makes it difficult for the bidder to get a clear picture of the project, especially if he is a stranger in your city, and if the streets are poorly marked. Anything you can do to simplify or clarify the work will be reflected in the prices you receive.

Another problem is inaccurate profiles. Often the Engineer uses the established grades of the streets rather than taking the time to run a survey along the center line of the proposed sewer. Since the Contractor's price is based on the type of excavation he encounters at the depths shown on the plans, it is highly important that the profiles be accurate. Any great amount of difference between the original plans and the job as finally built will probably be reflected in additional costs for over-depth excavation and extras for changing lines and grades.

III. Specifications—A clear, concise set of specifications which leaves no doubt as to what is required, and places responsibility where it is actually intended, will go a long way toward insuring a reasonable bid. (Here Mr. Hibbs quoted a number of extracts from specifications as horrible examples. Then he continued). The point I want to make is that, it is important, but not always enough that the Contractor and the Engineer agree on what was intended, the specifications must be clear to every one who has access to them or anyone who has any control, however remote, over the job.

Another thing we encounter which has a decided influence on the cost of the job is the presence of gas mains, underground cables, etc. Most specifications relative to this read as follows:

"*Public Utilities.* The Contractor shall ascertain from the various public utility companies the location of the utilities and services in the street before beginning any excavation and will be held responsible for any damage to said utilities." Or this:

"*Protection of Utilities.* Special precaution shall be taken in the vicinity of utilities both above and below ground such as gas, water, telephone, sewers, drain lines and other conduits, to avoid injury or suspension of use. Any injury or damages to such utilities, whether indicated on the plans or not, shall be repaired or replaced to the satisfaction of the Engineer or respective utility company and the same paid for by the Contractor. The Contractor shall co-operate with the utility companies in an effort to anticipate well in advance of the work, any crossings or possible interference of utility lines. Any expenses incurred attempting to locate said utilities, shall be paid for by the Contractor."

There, I believe, the Engineer is assuming a responsibility and expense for the City which he should not. Most utility companies are operating under a franchise. Their franchise states that they will maintain their mains, lines, or whatever type of service they operate, in the City streets at no expense to the city.

We have been told by a recognized legal authority that a city has the right to require a gas company to remove its mains during the construction of a sewer. We believe this is a little drastic and in most cases would not be required, but you can see that if a contractor is required to dig carefully under each service pipe in a street, his production will be cut from say 200 ft. per day to perhaps 25 ft. to 50 ft., depending on the number of obstructions. This, of course, will have quite an effect on the price the Contractor must bid and will be a cost to the City caused solely by the utility concerned.

Here is a specification which we believe approaches the problem in a more reasonable manner, and which we recommend for your consideration:

"*Existing Underground Utilities.* The Contractor shall be responsible for and shall immediately repair all damage to existing sewers, watermains, and house service connections operated by the owner which is caused by the construction work. The Contractor shall notify telephone and power companies, gas companies and others who maintain underground utilities sufficiently in advance of the proposed construction so that they may locate, uncover and disclose such work. The Contractor shall not be responsible for any damage to utilities unless they have been properly located."

This specification puts the responsibility of locating and exposing the obstruction on the utility company. Most of the delay would be thus avoided. We waste much more time carefully excavating and probing by hand methods in an effort to

locate pipes than we do in digging under them once they are located.

Most gas companies have very poor records of the location of their mains and services. The usual procedure has been for the gas company to mark the supposed location of their pipes by a stake or red flag. We have found, by sad experience, that the marker can be anywhere from 5 ft. to 50 ft. from the actual location. Too often we have slowed down the operations searching for a gas pipe and after deciding that there is no pipe present, taken one good cut with the pull shovel and torn out the pipe.

Now, of course, avoiding underground obstructions is not the only expense to the Contractor caused by the presence of gas mains. Insurance companies take a dim view of any job located in the immediate vicinity of gas mains, and rightly so. This naturally reflects in the liability and property damage rates and up goes the price of the job another notch.

Another tendency is for an Engineer to have a standard set of specifications, hundreds of pages in length, covering every type of construction from Building Construction through Plumbing, Seeding and Watermains—everything. These he will issue for every job, with a few pages of special provisions, referring to the particular job up for bids.

The special provisions cover everything that is pertinent to the job; why then confuse the issue by introducing pages and pages of specifications which have no bearing on the proposed work.

A standard set of specifications is fine, but I believe only that part for which you are asking bids should be included.

IV. Proposal Forms

There seems to be several schools of thought as to the best type of proposal forms. All of them, of course, have one objective in mind: To set out a series of unit prices, whereby the bids may be evaluated and the low bidder determined. The contractor then receives his pay for the quantities, which actually go into the job at the unit prices set out in his bid. This may or may not make the total cost of the job equal the contract amount, depending on whether the amount of work over-runs or under-runs.

To our way of thinking, the best type of proposal form, is one which is as simple as possible, but covers adequately the different quantities involved and leaves as few chances for disagreement as possible.

Last year we bid on a storm sewer job which involved 8 different sizes of pipe, three types of catch basins and standard manholes. The proposal contained 173 bid items. It was split up into divisions, main lines and laterals for each street and each change of direction, with separate totals for each lateral and separate bids on catch basins and manholes for each separate line.

Here was a proposal form which could have covered the job just as well with 12 bid items instead of 173 items, plus a number of sub-totals and grand totals which had to be read and tabulated.

Then we find proposal forms, which go into great detail, breaking down the job into items of excavation, furnishing and laying pipe, backfilling, resurfacing, etc. Many of these items must be measured and recorded as the job progresses. The inspector must spend more of his time determining the correct quantities than he does in seeing that the job is built according to specifications. Some items, such as the classification of various types of excavation, depend almost entirely on the judgment of the inspector. It is practically impossible for any two

men to agree as to exactly where one type of excavation stops and another begins.

The contractor who realizes this, will probably unbalance his bid. He will bid cheap on the items which are doubtful and increase the price on an item or items which can be measured accurately. Besides this, the contractor must, of necessity, include the costs of an extra man whose sole duty it is to accompany the inspector and keep an accurate record of the various quantities, otherwise, he may come up to the final estimate to find that the job has under-run by a large percent and have no way of proving otherwise.

Then we find proposals in which the pay quantities of the item covering the sewer pipe are measured not from center to center of manhole, but from outside of manhole to outside of manhole. In other words, the contractor is not paid for laying the pipe through the manhole. This is a refinement which simply adds some extra computations and does nothing toward lowering the bid price. You will find that the cost of laying the pipe through the manhole has been added to the bid price of the manhole or to the unit price of the pipe.

The removal and replacement of pavement is usually considered a bid item, and the pay widths are usually well defined. Our only squawk here is that, in most cases, a pay width is set up so narrow that it is impossible to maintain. Nothing much can be gained by this because the contractor will simply increase his unit price to take care of the additional width he will require.

Another type of proposal form which is quite commonly used is the form which **pays the** Contractor for various sizes of pipe laid at different depths, usually in increments of 2 ft. That is: 0 to 6 ft. deep; 6 ft. to 8 ft. deep, etc.

If your original plans are accurate and the job is built as planned this is a refinement which simply adds to the book work of both the Engineer and the Contractor. In other words, we believe, the proposal form which contains as few items as possible—items that can be accurately measured and do not depend on the judgment of an inspector will not only make less work for the Engineer but will help to secure the lowest possible bid.

V. Engineer's Estimate — I can cover this subject in just about one short sentence. "The Engineer's Estimate should be the *Engineer's* Estimate." We are often asked to give an estimate of what some future project will cost, and we are glad to do so. But it sometimes brings surprising results. Too often we are asked to give an estimate on a sewer, which we are told will be right out in the country, 9 ft. average cut, good digging, nothing in the way, just a nice line of pipe.

Sometime later the job comes up for bids. What do we find? It's out in the country all right, but is in the road ditch alongside a busy highway. The road ditch averages 4 ft. below the adjacent ground and 5 or 6 ft. below the highway. There is not room enough for the spoil banks and a good percentage of the line is in wet excavation.

What is the result? We feel we must submit a bid. We tell the Engineer his estimate is too low and give him the reasons why. He still wants us to bid. Several other contractors are also bidding. They surmise that the Engineer's Estimate originated in our office and think that we probably made it high enough to protect ourselves. Consequently, they set out to beat our price. They may or may not be able to do it but since we have had

to revise ours upward it makes little difference—we are beaten.

I've seen this happen many times. We will still be happy to assist anyone in arriving at an estimated cost of a job, but please don't feel that you are giving us an inside track and please try to look at it from a construction standpoint, when you give us the information on which to base the estimate.

Now, you may have gathered from all this that we are dissatisfied with all plans, specifications, sizes of projects and methods of bidding and generally hold the Engineering profession in ill-repute. Such is not the case. Our company was first incorporated in 1923 and we have been working with and for engineers ever since. We hold them in the highest regard and know of no finer group of men anywhere.

The vast majority of your plans, specifications and methods leave nothing to be desired, and the next job you have up for bids—we'll be there.

If however, I've given you a few things to think about, and if in the future you see fit to adopt a few of our suggestions, we will be happy.

Sanitary Fill Data

(*Continued from page* 86)

week from the residential areas; but in the summer when the population swells to around 50,000, there are two collections a week from the residential areas. On the average, 1300 truck-loads of refuse are deposited at the fill each month by the city-owned collection units. In addition, private collections bring in about 1,000 loads a month. There is no charge for this; the dump handles all of the material that is brought to it.

The landfill, which is under the direction of Frank Hobart, Superintendent of the Street Department, is in operation 5½ days a week. Like all other fills in Indiana, it is under the control of the State Department of Health. It is expected that this site will care for all of the city's refuse for the next three years.

The equipment shown in the photos (page 86) will, in the future, be used mainly on road and street maintenance; a new International TD-14A with Drott bullclam has been purchased for use on the fill.

• • •

County Highway Department Operates Sanitary Fill

The sanitary landfill operated by DuPage County, Ill., serves the surrounding areas and affords relief from the dumping of refuse indiscriminately along roadsides by people who live where no collection and disposal facilities exist. The land now being used for the landfill was formerly a sheep-grazing area which has been leased from the farmer-owner. The operation at this site is of the trench type. A dragline was used to remove the topsoil and to stockpile it. Then an International TD-14A crawler tractor and Drott bullclam was brought in.

Dumping is by city, county and private collection units; these bring in about 2,000 tons per month of refuse. This is dumped into the trench where it is spread and compacted by the tractor. At the end of each day, the compacted refuse is covered with about 12 ins. of sand and gravel previously excavated from the trench; when a section has been filled to the desired depth, it receives a compacted cover of about 24 inches of fresh dirt.

It is estimated that this fill will be completed within a year. Then the topsoil will be replaced and the area will be turned back to the property owner.

21 Units in Amarillo Texas' fleet of PAK-MOR Refuse Collection Equipment

AMARILLO PICKS PAK-MORS

As did San Diego, New Orleans, Denver,
Mexico City, San Antonio, El Paso, Atlanta,
Caracas, Coral Gables, Albuquerque,
and over 500 others

FOR THESE GOOD REASONS–

Reduced costs through–

Bigger loads at less cost per load.

Denser compaction (pressures to 40,000 pounds)

Fewer trips to dumps

Faster loading through larger openings

Quicker emptying as whole rear end of cylindrical bodies opens instantly

Operation by one simple control

Dumps at any angle, whether full, half full or quarter full

Sizes 12 to 50 yards

Proven reliability in service

All resulting in lowest over-all costs; more yardage handled per man and per trip; better satisfied citizens, with better public relations for the Administration.

In these advantages and savings, PAK-MORS pay for themselves many times over.

NO OTHER REFUSE COLLECTION UNIT COMBINES ALL THESE FEATURES

Lighter units, heavier payloads

Sealed doors prevent leakage of any kind.

Full size rear doors permit entire load dumping.

Compresses refuse into full load under 20 tons pressure.

Heavy duty packer plate travels full length of body.

Extra wide openings means easier, faster loading.

Low loading height.

Fast inexpensive installation on most conventional or cab-over trucks.

No danger of center of gravity shifts.

Write today for 16 page illustrated booklet and name and address of nearest distributor demonstrator. OR SEE PAK-MORS AT BOOTHS A-16, A-17, A-18. American Public Works Association Equipment Show, Atlantic City, Sept. 19-22.

PAK-MOR MANUFACTURING CO.

Loop 13 and Roosevelt Avenue
P.O. Box 6147, San Antonio, Texas

Equipment Management

(*Continued from page* 116)

cess to records showing what parts were replaced at the last inspection. Again, printed forms should be used. Space should be provided for the speedometer reading and the types of inspection should be listed so that the proper inspection can be indicated by a check mark.

Unit Replacement

We have found that unit replacement is a time saver and economical. For instance, on any group of trucks exceeding ten or more, we immediately buy a spare clutch, engine, transmission, carburetor, and so forth, for this model, replacing the defective part or parts and sending them to our engine and transmission shop for overhaul and replacement into stock. This naturally gets a truck back on the road in shorter time. Standardization also is a great help. For instance, we carry only two sizes of batteries in stock. All trucks also have one make of split-type rim for tire change convenience.

Operator training is important, and yet it is resisted when funds are asked to set up a school. All our operators are required to take a civil service examination consisting of a written test, covering fundamental mechanics; a machine test, showing reaction and perception; and a practical driving test, using a four-wheel-drive truck which the operator is required to maneuver in a very restricted area.

In addition, we use two skilled men to help teach the new operators. A new man is put on a truck with one of these men for a period of two or more days. He is thoroughly briefed on how we want him to drive, and he is impressed with the need for observance of traffic rules. He is shown that the City name on a truck gives him no consideration; he must set an example to other drivers. Drivers arrested for traffic violation, or having accidents due to violations, are suspended for a period ranging from 3 days up.

All operators are encouraged to attend the showing of films furnished by the National Safety Council. These films have been shown in the auditoriums of the local breweries. Needless to say, they were well attended. However, I am trying to get funds for paid, compulsory classes for evening sessions where skilled insurance adjustors and others would lecture on proper traffic procedures and where skilled factory representatives would lecture on the operation of different models or types of equipment.

Equipment Replacement

Our heavy duty trucks average 6 years, and passenger cars 4 years. However, in police squad cars we have developed, with the cooperation of the chief, a 60,000-mile replacement plan, and we have been trying to keep as close to that as possible. In addition to the lower operating cost, we benefit in the higher trade-in allowance as these cars are only 14 to 18 months old.

In specialized equipment the specifications must be written around a type. Be sure that this piece, as specified will do your particular work and then stick to the specifications. No contractor buys equipment that is not best adapted for his operations; he could not afford to. There is no reason why a city should be satisfied with less. Some salesmen will argue that he is a taxpayer and is entitled to sell the city something. Sell your Purchasing Board on the item you need. You are doing a far more important job than buying something John Doe wants to sell you.

Sewage and Water Treatment Problems Caused by the Rio Grande Flood

R. H. WEISS,

District Engineer,

Texas State Department of Health

THE Rio Grande flood of June and July, 1954, caused problems at many water and sewage treatment plants along that river and its tributaries. A 10- to 15-in. rainfall on the watershed of the Johnson Draw of Devil's River June 27 and 28, caused the loss of an 8-in. line across the draw at Ozona. The crest reached Ozona about 5 AM; there was heavy property damage and loss of life. It was not determined immediately that the line was broken, so much water was lost from the reservoirs; and some additional water was lost from broken service connections of houses which had been washed away.

When the water receded Monday afternoon (the 28th), the service connections to the washed-away houses were closed and the broken section of the pipe valved off. Since the power lines into the town had failed, it was necessary to use the emergency gasoline engine driven generator during this time. The water plant was not damaged since it is located on a hill and not subject to flooding.

The Rio Grande rose at Del Rio on Sunday, June 27, and reached its crest of 38.5 feet on Monday, June 28. Since very little rain had fallen on the San Felipe Creek water shed, this stream was normal and the backwater from the Rio Grande caused little damage. The water plant which obtains water from San Felipe Springs operated continuously during the flood and was in no danger of being flooded since San Felipe Creek did not rise. The sewage treatment plant which is also located on San Felipe Creek was not flooded and suffered no damage.

At Eagle Pass

As the crest moved down the Rio Grande, it exceeded the previous high record at Eagle Pass of 49 feet which had occurred on September 2, 1932. A crest of about 54 feet was reached around 4 AM on Tuesday, June 29.

At Eagle Pass the surface water treatment plant was shut down at 3:30 AM on Tuesday morning when leaks in the building basement walls increased to a point which made it appear dangerous to the personnel operating the gasoline engine driven pumps used to dewater the basement. The shower, toilet, and other plumbing fixtures had to be plugged to keep water from entering the building. The door entering the west end of the building was caulked and sandbagged to prevent the entrance of water into the basement where the main switchboard and wash water pumps are located, and into the room housing the motors of the vertical high lift pumps.

Provisions had been made for pumping water from the basement by installing two emergency gasoline-driven pumps; but due to the excessive leaks in the joints of the concrete it was felt that structural failure could occur, with loss of the lives of the operators of the pumps; so pumping was discontinued.

The elevated storage tanks were valved off from the distribution system so that treated water would be available in case of complete flooding of the plant. One of the high service pump motors was disconnected and stored on a higher floor.

As the water receded at 6 o'clock on Tuesday morning, June 29, it was found that, though several feet of water had entered the basement, it had flooded only the wash water motors; the main electrical switch had not been damaged. Electricity was restored and it was found that the raw water submersible pump had not been damaged and raw water was available. Water was pumped from the basement where the wash water pumps were located. When checking on the water in the clear well to determine the chlorine residual, it was found that about one foot of water covered the clear well so it became necessary to pump off this water before the plant could be put into operation for fear of structural failure of the roof of the clear well. Each of the three filters was dosed with five pounds of 70 percent chlorinated lime and an additional five pounds of chlorinated lime was added to the final sedimentation basin. The high lift pumps were checked for operation against closed valves and the disinfection equipment put into operation. By noon, Tuesday, the treatment plant went back into service. The free chlorine residual in the water to the mains was over 3 ppm; by 1 PM all sections of the City of Eagle Pass had adequate water pressure, with residuals of more than 1 ppm. No major main breaks occurred which was fortunate since the filters could not be backwashed until replacement motors were secured or the existing ones baked. An unusual demand might have overloaded the plant and plugged the filters. An additional wash water pump motor was secured and installed, so that no further shut down of the treatment plant was necessary.

At Laredo

During the afternoon of Tuesday, June 29, the Rio Grande reached 52.2 feet at Laredo, a record which had previously been reached on September 3, 1932. The river continued to rise during the afternoon and night. On Wednesday a crest of 62.2 feet was reached.

Shortly after 6 PM on June 29, the raw water pumps failed due to flooding and the old part of the water treatment plant also was flooded. This put out of service a capacity of 9 mgd, and leaving only the new 5 mgd treatment plant in operation, and it was without a source of raw water. The high lift pumps from the new plant were shut off and the wash water tank was filled so that water would be available for the various chemical feed machines and plant appurtenances, and to operate the hydraulic valves in order that the plant could be put back into operation with a minimum of difficulty as soon as raw water was obtained.

The two elevated storage tanks were valved off to conserve the treated water for use in case of emergency. Two fire engine pumpers were put into operation shortly after 7 PM on June 27, and operated during the night and part of the next morning. Due to the height of rise and to trouble with the fire pumps caused by the high turbidity, very little water was obtained. Arrangements were made to mount an electrically driven pump on a truck, draw raw water from the stream and pump to the aerator but this failed since, as the river began to drop, it fell so rapidly that it was

not possible to keep the suction in water. Also because there were washouts in the roads, this unit could not be moved into a satisfactory place.

It was not possible to reach the old plant and the raw water pump stations until the morning of July 1 to make a survey of the damage and determine the needed repairs so that service could be restored. Since it was known that both the old and the new raw water intakes had been flooded, arrangements had been made for the delivery of a skid-mounted emergency gasoline engine pump with a capacity of 5 mgd. This was delivered to the plant after noon of July 1.

The survey revealed that the old treatment plant had been badly damaged. The water had reached the second floor and quantities of mud, debris and logs had penetrated into the various buildings. The high lift pump, motors and switch gear were flooded, chemical feed machines badly damaged, and electrical wiring ruined. To get the road to the plant repaired would require thousands of yards of gravel and dirt. In addition, the area around the raw water intake had been washed away, causing the 30-inch pipe header to break. To restore this would require a very large amount of work.

It immediately became evident that the facilities and equipment of the Laredo Waterworks would not be sufficient to restore service so the officials contracted with a construction company to start restoration work immediately. It was necessary first to make repairs to the road to permit bringing in the needed equipment. This was soon done. Then, since the settling basins were full of water, the emergency pump was brought in and used to pump about a million gallons of water into the mains on July 2. To get the emergency pump to the river, an access road had to be built. A temporary steel line was installed and connected to the section of the undamaged 30-inch raw water line to the new plant. Then, after thousands of yards of gravel and dirt had been used to build the road to the river, it became evident that some type of floating mount was essential to get a satisfactory location for the emergency pump. It was learned that the Army Engineers were to construct a pontoon bridge at the site of the washed-out International Bridge between Laredo and Nueva Laredo, so arrangements were made to secure a section of pontoons on which the emergency

pump could be mounted. This was accomplished and late on July 4, this emergency pump was put into operation and raw water was again available to the new treatment plant. All of the water delivered to the distribution system had chlorine residuals of at least 10 ppm and this dosage was continued until July 8. Chlorine residuals were checked over the entire distribution system and it was found that they were adequate. Samples were collected for bacteriological analyses and all were satisfactory. No major breaks occurred in the distribution system.

Rehabilitation work was then started on the low-lift pump stations to put them into operation. Water was pumped from the old low lift station, the flooded motors removed and repaired and the motors from the vertical pumps on the new low lift station were removed for repairs. The pipe connections from these units to the 30-inch raw water line were repaired. On July 12 an adequate raw water supply was available for the new plant. The rate of filtration at the new plant was stepped up to around 7 mgd which is a minimum for the City.

The repairs to put the old plant into operation are progressing (July 26) as rapidly as possible. However, each day finds additional problems caused by damages of various kinds that were not at first noticed. The lessons taught by this flood will no doubt form the basis for changes during rehabilitation to provide a greater factor of safety in keeping this plant in operation during severe floods.

Disaster Plans

It was proved during this flood that any disaster plan can be successful and effective only if the course of action is well planned and adequately trained personnel are available to carry it out. Probably the greatest difficulty is to realize the vast amount of damage that can be caused by a flood of this kind, emphasizing the necessity of knowing how to design and construct a plant which will withstand such ravages of nature. The community can get by with a curtailed water supply provided it is safe. However, without water in the distribution system, fire protection ceases and sanitation facilities are threatened, creating additional health hazards.

It is also essential to have adequate public relations so that the citizens of each community can be informed of the steps to take to protect themselves and their property, and to secure cooperation in carrying on protective measures in order to prevent panic and to relieve anxiety.

Communications certainly are essential and again mobile radio communication proved its usefulness and contributed greatly to the efficiency with which restoration operations were carried out.

A disaster plan should include provisions to prevent employees and volunteer workers from taking unnecessary risks. The aid of the duly authorized law enforcement authorities is essential to prevent the public from causing undue interference in the disaster area.

During this flood, electric power was available to Eagle Pass and at Laredo at all times. However, for twelve hours, power was not available at Ozona and a gasoline engine standby generator unit supplied the needed power for the water plant.

The fact that entire plants, clear wells, pumps and motors are easily flooded indicates that designing engineers, as well as regulatory bodies who are responsible for approving water plans, should pay special attention to plant location.

The proper protection of raw water pumps and motors by setting at a level equal to that of the top treatment basins, or the use of submersible pumps and motors, might be of value in maintaining a raw water supply.

Thus we come to the point: To what elevation will the next flood reach and is it always a flood which causes a water shortage? When we look back to the flood of twenty-two years ago and realize that the 1954 flood was ten feet higher; or we look back one year and find the City of Laredo without water for two days because the Rio Grande was dry, we ponder and say, "Quien Sabe?"

• • •

Water Works Installs 980-hp Gas Engine

To drive a 700-kw generator supplying power to pumps, Houston (Texas) Water Department has installed a Worthington 980-hp supercharged spark ignition gas engine. This is a part of the San Jacinto River project described in the May, 1954, issue of *PUBLIC WORKS*.

Research in Smoke and Air Pollution Prevention

Two provisions in the Housing Act of 1954 (HR 7839) are of unusual interest. One provides for research, setting up a $5 million authorization to determine the causes of air pollution, develop preventive measures and guide municipalities in smoke elimination and air pollution prevention and control. The other authorizes a revolving fund of $50 million to allow the HHFA to make loans for purchasing, installing, constructing, reconstructing or remodeling any device to reduce air pollution so as to conform with municipal ordinances. It would appear to Public Works that the latter provision could be used—perhaps both of them—by municipalities in connection with smoke control at municipal incinerators.

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Street Cleaning and Refuse Costs in Toledo

Cost of Toledo's street division including incinerators, dumps and landfills, refuse collection, street cleaning and repair and sewer maintenance in 1953 totaled $2,685,568.34, or a per capita cost of $8.34, according to the annual report of Street Commissioner Harry Loucke.

For refuse collection, the total cost to the city was $1,110,534.68 or a per capita cost of $3.45; for waste disposal, $110,629.66 or 34 cents per capita; street cleaning, $616,495.01 or $1.91; snow and ice control, $54,970.69 or seventeen cents; weed cutting, $25,251.21 or eight cents; dust laying, $15,113.97 or five cents; street repair, $540,092.77 or $1.68; sewer maintenance for the street division, $212,480.35 or 66 cents per capita.

The cost to the City per stop for picking up garbage and rubbish at 87,000 residences was 24.5 cents.

The number of cubic yards of waste collected per capita in 1953 was 1.596. Cost per mile traveled was $3.57; cost per load, $30.56; per cubic yard, $2.16. Waste disposal in 1953 cost $3.81 per ton for incineration of 21,455 tons of garbage. A total of 209,180 cubic yards of waste was placed in sanitary landfills at a cost of 13.8 cents per cubic yard.

The division of streets in 1953 removed 27,135 cubic yards of street sweepings and 39,133 cubic yards of leaves. Snow and ice control operations in 1953 required 4,115 tons of salt. Fifty million square feet of weeds were cut. Dust was laid on 80 miles of streets.

PUBLIC WORKS DIGESTS

THE HIGHWAY AND AIRPORT DIGEST

Impact Tests Of Barrier Curbs

Last year the California Highway Commission conducted impact tests on 11 different designs of barrier curbs, which are used on various bridges. As a test car, a 1949 Ford sedan was used, provided with special bracing. A camera was installed that automatically recorded the speedometer reading just before the car hit the curb. This car was driven by an experienced test driver, who wore a crash helmet and safety belt. Three motion picture cameras recorded each test from three positions. After each test, a mechanic examined the car and repaired damages. Each curb was contacted at approach angles of 5, 10, 15, 20 and 30 degrees, and at speeds of 5 to 50 miles per hour. The 149 collisions damaged 12 "A" frames, 10 wheels, 1 king pin, 1 set of tie rods, 1 set of coil springs and 2 tires. Of the 11 types of curb tested, 8 were 9 in. high, 2 were 12 in. high and one was 6 in. Cross-sections of them are shown in the accompanying cut. Curb VI-M is the same as VI, but with the rounded nose metal-faced. Nos. V and VI-M and the two 12-in. curbs were found to be the most efficient, but each was more efficient than the others under certain conditions. At angles of collision of 15° and under, No. V was the most over-all effective. It not only prevented climbing but acted as an external brake on the forward motion of the car and caused its post-collision travel to be close to and parallel to the curb. At angles of 20° and higher the car mounted this curb easily. Considered as a barrier, VI-M was more efficient than V, but it furnished little or no retardation of the velocity of the vehicle, and the car ricocheted off the curb at an angle and speed nearly equal to those of the approach. At angles up to 20° and speed up to 45 mph the car did not even partially climb this curb, but almost overturned. Curb VI, differing only in the absence of metal facing, was mounted at all angles above 5°, and even at 5° was mounted at 30 mph. The two 12-in. curbs were effective as barriers but did not have the braking effect of curb V.

"Barrier Curbs: Impact Test Program Proves Most Valuable". By J. L. Beaton, Supervising Hwy. Engr. *California Highways*, June.

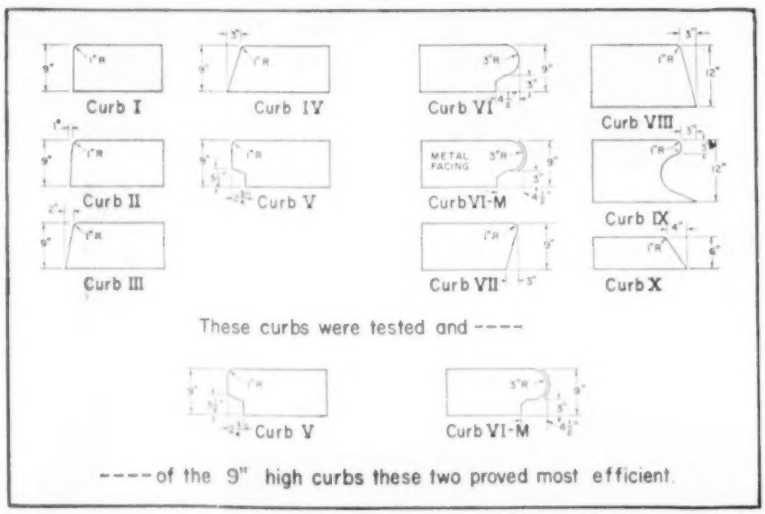
Spraying Roadside Vegetation

The ultimate aim in destroying roadside weeds and brush is to promote a good strong stand of grass, which gives a more pleasant appearance even if not mowed. A number of county and state officials describe their practices. The general one is to use 2,4-D and 2,4,5-T. Some prohibit the use of these chemicals in agricultural areas during crop periods; others say such spraying can be so controlled as to eliminate the possibility of crop damage if the spray equipment is good, the operator skilled and careful, and the wind velocity low. Brush sprayed when in foliage becomes very unsightly; it is better to cut the brush and spray the stubble.

"Controlling Roadside Vegetation." A forum discussion. *Better Roads*, May.

Radiant Heating To Keep Pavements Skid-free

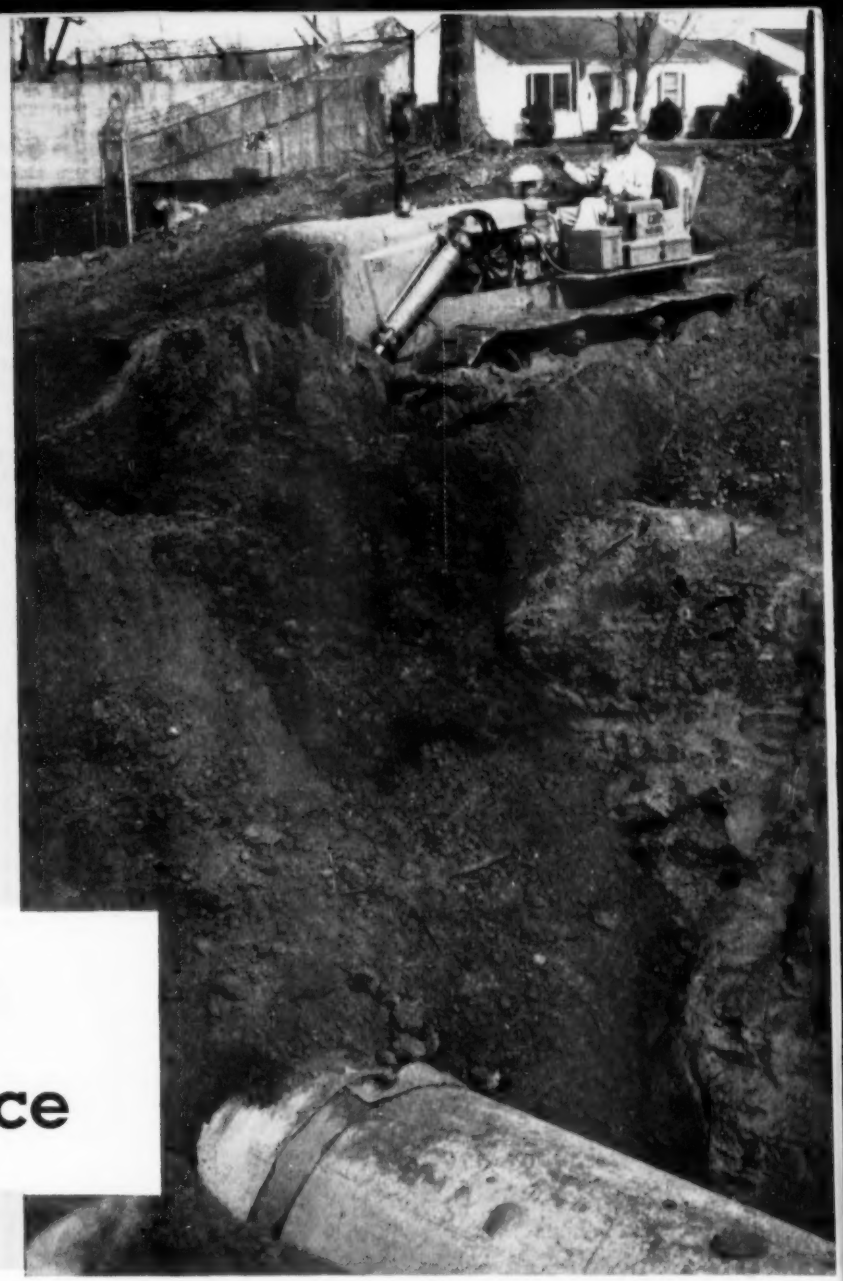
In building the Boston, Mass., Central Artery, many of the ramps had to meet the surface streets nearly at right angles with a short turning radius. When the turns are covered with ice, as would be very common in Boston, skidding would be probable. To prevent such a dangerous condition, 300 or 400 ft. at the lower end of the ramp will be heated by radiant heat. The pavement here is a 9-in. concrete slab covered with 2½ in. of bituminous concrete. Heating grids of one-inch wrought iron pipe, forming a sinuous



Courtesy Cal. Hwys. & Pub. Wks.

● **TYPES of barrier curbs tested in California.**

HOW TO SAVE 50% ON equipment maintenance



The Caterpillar Diesel D6 Tractor with No. 6A Bulldozer shown here is owned by F. M. Stowell. It's working on a contract for the City of Tulsa, Oklahoma, backfilling sewer trench on the Arkansas River interceptor line. This 3½-mile sewer project averages 14 feet deep and the pipe is 36 to 60 inches in diameter. It will carry sewage to a disposal plant across the river.

The D6 has already given its owner years of steady service and its hour meter registers nearly 5000 work hours. On this backfilling job it regularly handles 1500 to 1750 cubic yards of earth per day.

Mr. Stowell also has two shovels powered by Caterpillar Diesel Engines — a Bucyrus-Erie with a D13000 and a Lorain with a D318. He says:

"I can maintain my CAT equipment for 50% of the cost of maintaining other equipment. The D13000 Engine in the shovel has worked 3000 hours without being touched."*

Many municipal street and sewer departments have found similar savings with Caterpillar equipment. Soundly engineered and honestly manufactured, these machines have long work life *built in* at the factory. And good dealer service keeps them running with a minimum of down time and maintenance.

Ask your Caterpillar Dealer to prove the savings you can expect when you standardize on Cat equipment. And get a demonstration right on your job.

Caterpillar Tractor Co., Peoria, Ill., U.S.A.

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coil, are placed in the top of the concrete. Through this will be circulated a solution of water and ethylene glycol, heated by means of steam from existing underground steam mains of the local power company. Estimating an average use of 400 hr. per year, the operation will require 5,600,000 lb. of steam per year for the 14 ramps. It is calculated that this amount of steam will be able to melt snow at the rate of one inch per hour. This capacity can be increased if necessary.

"Heating Provides Built-In Safety for Expressway Ramps". By Leo F. De Marsh, Asst. Engr., Mass. Dept. of Pub. Wks. *Public Works*, August.

Winter Maintenance Of New Hampshire Highways

The New Hampshire State Highway Dept. in winter maintains 3,200 miles of state highways at a cost of approximately $2,000,000 a year. Beginning in 1941, previous to which they had relied upon sanding, they have developed their present method of ice prevention through the use of sodium chloride. On a 2-lane road, when snow compacts under traffic or during freezing rains or when plowing leaves some snow on the pavement, they spread sodium chloride for a width of 2 ft. along the center of the pavement. If a combined sleet and rain storm leaves an inch or more of ice on the pavement and the temperature drops to zero or below, it is necessary to use calcium chloride together with sodium chloride to dissolve the ice. From 100 to 200 lb. of calcium chloride with 300 to 600 lb. of sodium chloride per mile has successfully removed the ice under these conditions. The average annual cost of applying chlorides is $820,000; sanding costs $260,000; plowing and snow fences cost $860,000; and night weather control costs $60,000.

"25 Years of Winter Maintenance in New Hampshire". By Le Roy F. Johnson, Maint. Engr. *Public Works*, August.

Preventing Stripping In Coated Macadam

Since January 1953, the English Amalgamated Roadstone Corporation has been conducting experiments to learn how best and less expensively to increase the adhesion of bitumen to aggregates in constructing coated macadam pavements. They set a limit to the cost of such treatment of 1s 6d per ton of aggregate and found that this eliminates all commercial additives. Using hydrated lime, they found that this gave good results with cut-back bitumens, but not with straight run bitumens. Combinations of hydrated lime and tar gave better results. But further tests led to the conclusion that just as good results were obtained when the lime was omitted and 10% of tar was added to cut-back bitumen. For a practical test, they have constructed several sections of road using the tar-bitumen combination with a variety of aggregates.

"Experimental Work on Adhesion in Coated Macadam". By L. C. Hopkins, Tech. Mgr. of the Corp. *The Surveyor*, June 12.

Joint Renovation In Minnesota

The Minnesota highway department has developed a procedure for joint and crack renovation which, it believes, will provide a more nearly "bumpless" seal, give superior weather protection to the pavement, and reduce joint maintenance to a negligible figure for many years. During the past four years it has employed the procedure

on 1038 miles of pavement. The work is always done by contract on the basis of pounds of sealing material in place plus daily pay for flagmen and other incidental labor. Hot poured rubber asphalt is used. First the joint is gouged free of old seal material, then scraped clean with a special blade; then a power brush scrubs away loosened debris; joints and surrounding pavement are swept with a power sweeper. Finally the joints are blown out just before being poured. The joint material heated to not over 450° is poured into the joint flush with the surface. When this cools, leaving a slight depression, it is filled to ⅛ in. above the surface, using a shoeless applicator. Most important is getting the joint absolutely clean; next in importance is pouring the joint as described; third, continuous positive agitation of the filler material to assure uniform heating; finally, rigid inspection.

"Road Joint Renovation by Contract Being Continued in Minnesota." By G. A. Meskal, Asst. Maint. Eng'r. *Roads and Streets*, July.

Low-Cost Bases For Secondary Roads

Clinton County, Ill. has been experimenting with the use of local materials in constructing two-course and three-course combination bases for bituminous surfaces on its secondary roads. Their aim is to utilize low-cost local materials in such combination with higher-priced and more reliable materials that a high-class farm-to-market road can be built within the budget limitations of a small county. They are particularly interested in composite bases, using low-cost material for the sub-base, covered with a higher-class upper base material. The granular material used in the sub-base should give better vertical and horizontal drainage and greater resistance to the submergence of the base into soft and silty subgrades. The construction of several such combinations is described. One consisted of a soil-cement base 6½ in. thick and 19 ft. wide, covered with a bituminous surface consisting of four shots of asphalt and three applications of ½-in. and ⅛-in. stone chips, at a complete cost of $51,000 a mile. In another road they used a 5-in. compacted thickness of pit-run gravel 22 ft. wide; a second course of material salvaged from the old road with 1½ in. compacted thickness 22 ft. wide, topped by a 2½-in. compacted thickness of rock from a local quarry graded from ¾-in. down to fines. Calcium chloride was applied to the surface, which was covered with two coats of asphalt and chips.

"Experimental Bases Designed to Meet Budgetary Limitations." By James G. Cooney, Co. Supt. of H'ways. *Better Roads*, May.

Snow Control In The District of Columbia

The snow program of the District of Columbia includes plowing snow from the main thoroughfares (342 miles); removing snow by hauling from 33 miles in the business area; cleaning crosswalks, catch basins and fire hydrants; and spreading abrasives and chemicals. The major part of the cost is for spreading abrasives and chemicals, and hauling snow. In sanding streets, the equipment follows scheduled routes. In addition, 250 sand cans are placed at strategic locations for voluntary use, and special sand crews are stationed on the more critical hills to assist traffic. Approximately 15,000 tons of sand have been used in one winter. The sand costs $1.50 a ton. During heavy snowfalls, the

use of abrasives is not as effective as sodium or calcium chloride. However, the use of these is undesirable in Washington because it results in the shortcircuiting of the underground third rail of the transit system.

"Snow and Ice Control in a Border Line City". By Wm. A. Xanten, Supt. Div. of San. *Public Works*, August.

Blast-Furnace Slag in Concrete

Finely ground water-granulated blast furnace slag containing a commercial air-entraining agent has been developed recently for use as a blend with portland cement in the same ratio as natural cement is commonly blended (1 to 6 of portland cement). The Bureau of Public Roads made tests to determine the effect of such a blend on the strength and durability of paving concrete. These indicated that finely ground blast-furnace slag containing an air-entraining admixture can be used advantageously in concrete as a blend with non-air entraining portland cement. The durability of concrete containing this blend was equal or superior to that of corresponding concretes made with either air-entraining or non-air-entraining portland cements used alone or blended with natural cement. Similarly, favorable strength performance was observed except in comparison to concrete made with unblended non-air-entraining portland cement.

"Properties of Concrete Containing a Blend of Portland Cement and Air-Entraining Ground Blast-Furnace Slag". By William E. Grieb and George Werner, Eng'rs of BPR. *Public Roads*, August.

Building Expressway On Hydraulic Fill

The Greenwich-Killingly Expressway is being built to replace part of the old Boston Post Road, bypassing the business section of New Haven, Conn. Two miles of it is located on a fill in the harbor which extends a maximum width of 1700 ft. This fill was made by the Federal government when hydraulically deepening by 10 ft. the main harbor channel and turning basin, the amount of such fill totaling 5,000,000 cu. yd. of sand, reaching a maximum height of 16 ft. along the expressway right-of-way. The bottom of the harbor here consisted of 30 ft. of soft organic clayey silt. Beneath this is 10 ft. of brown sand and silt, and below this about 60 ft. of silt with some fine sand. It was considered to be impracticable to remove this soft material and replace it with selected material, and the method of consolidating the soil by use of vertical sand drains and a sand blanket was adopted. The blanket was made 4 ft. thick and horizontal drains were placed across it at 100-ft. intervals. Sand wells 20-in. in diameter were driven at 10 ft. to 12 ft. intervals. More hydraulic fill was placed on the blanket at the rate of 1 or 2 ft. of thickness a week, to a height giving 6 ft. of overload to hasten settlement, to be removed before constructing the final pavement. It is estimated that a 25-ft. fill so built will ultimately settle 7½ ft., and a 35 ft. fill will settle 9 ft. This settlement is gradual, 50% occurring during the first 20 months and only 75% of it taking place during 50 months.

"Expressway Crosses New Haven Harbor Front on Hydraulic Fill." By Ernest T. Perkins, Asst. Chf. Engr., Conn. State H'way Dept. *Civil Engineering*, July.

Other Articles

"**Snow and Ice** Control" in Watertown, N Y. By G. Leland Wood, City Mgr. Public Works, August.

"**Repair Paving Equipment,** We Use Winter to" of the Oregon State Highway Dept. By Emil Halik, Equipment Supt. Public Works, August.

"**Geologist** for Help with These Highway Problems, Call in the." By W. A. Warrick, Penn. Dept of H'ways. Better Roads, May.

"**Additives for Bituminous** Materials, Heat-Resistant Properties of". Investigation by Bureau of Public Roads. By Paul F. Critz, Physical Research Engr. BPR. Public Roads, August.

"**Analysis of Soils**, A Study of Dispersing Agents for Particle-Size." Some found effective, others ineffective. By Adolph M. Wintermyer and Earl B. Kinter, Physical Research Engrs. BPR. Public Roads, August.

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Paving for Subdivisions

(*Continued from page* 102)

regulations. On principal thoroughfares in residential zones, Raleigh engages to share in the cost of grading. The charge against the abutting property is the percentage of the total cost of grading as the ratio of 27 ft. (width of standard residential street) is to the actual width of the improvement. The cost of the base and surface courses in excess of residential street widths

is paid for by the city. The same is true of added base thickness and surface thickness.

On principal thoroughfares in property zones in any district except residential there are similar provisions based on the 43-ft. width of a standard commercial street. Principal thoroughfares, therefore, are the only ones for the construction of which Raleigh shares the cost. The city makes no payment for excess width or heavy construction for streets designated as residential or commercial.

So far as the developer is concerned, his chief financial inducement to apply for annexation *beforehand* is the remittance of the service connection charges. If, however, no annexation agreement is involved, the developer is not only obliged to pay for water and sewer mains outright, but these become part of the city system upon completion and acceptance. This means, of course, that the developer can have no later recourse to a claim against the city if his project should become annexed.

The subdivision developer who has no annexation agreement with the city remains obligated to pave his streets. He is exempted only from installing curbs and gutters except on grades in excess of 4 percent. He is also responsible for providing drains as required by the terrain.

Are the developers of subdivisions co-operating well in this program? They are indeed, according to City Manager W. H. Carper, who agrees that all developers think they are over-regulated. He finds, however, that those of Raleigh are co-operating well because they see that the subdivision regulations are enhancing their developments.

Moreover, Mr. Carper points out, the regulations permit the proper co-ordination of all streets, allow for over-all city planning, and indicate what needs there are for such facilities as belt boulevards for which Raleigh is now requiring a full 100-ft. right-of-way.

"It makes people think of a city as a good place to live," he adds, "when the homesite buyer buys a lot as part of a packaged deal. He is on a paved road, with water and sewage services already provided, and he can thus consolidate his financing."

And Mr. Stevens adds: "The whole thing is worlds away from what happened during the '20s when municipalities provided developers with utilities at the taxpayers' expense."

PUBLIC WORKS DIGESTS

THE SEWERAGE AND REFUSE DIGEST

Deflector Storm-Water Inlets

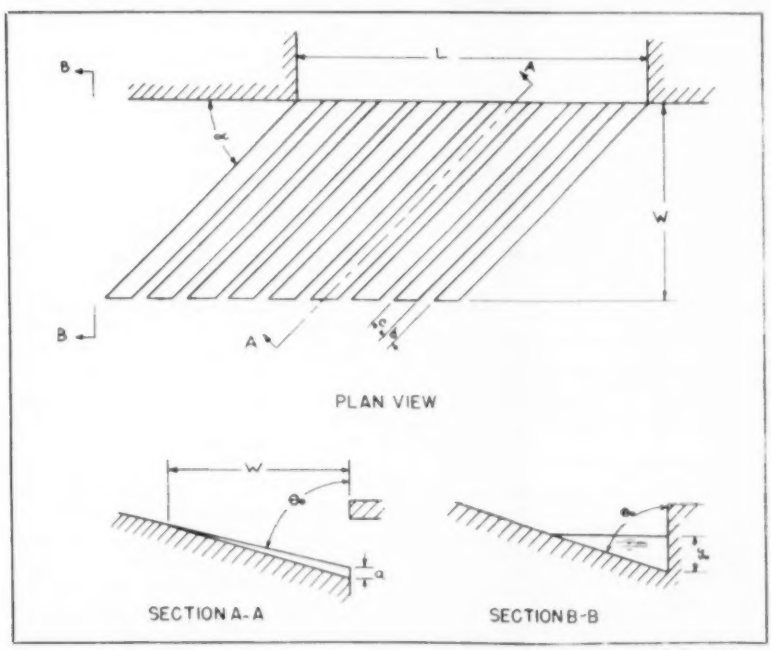
Engineering professors of Johns Hopkins University have made a study of storm water inlets of various types, some in the gutter, others in the curb face. This article deals with curb inlets in front of which diagonal slots are cast into the gutter. The ridges between the slots are called deflectors. When these inlets are installed in steep streets their intake capacity is greater than that of most other types of inlets. The tops of the deflectors are level with the pavement and these inlets are less annoying to traffic than depressed inlets. Tests were conducted using different dimensions and angles of deflectors. These showed that the capacity of deflector inlets increases with the street grade, a characteristic the opposite of that of other inlets: in steep streets the capacity may be several times that of undepressed curb inlets.

"Hydraulic Behavior of Storm-Water Inlets". By Wen Hsiung Li, Bertram C. Goodell and John C. Geyer. Johns Hopkins Univ. *Sewage and Industrial Wastes*, July.

Financing Sewerage at York, Pa.

A $4,000,000 treatment plant is being built for York, Pa. under a state law providing for Authority Financing. The York City Authority in 1950 took title to all existing facilities and entered into a 31-year lease with the city. A revenue bond interest rate of 1.832% is paid by the city, which collects sewer service charges calculated to furnish the necessary revenue plus a 26.84% cushion each year. The charges are based approximately on 75% total water revenue or 90% of water revenue from fixtures chargeable for sewer rental. The new plant is an activated sludge one. The sludge will be elutriated and filtered on coil spring type vacuum filters; followed by flash drying and incineration or bagging for sale to farmers.

"'54 Model: On Sound Financial Foundation." *Engineering News-Record*, July 1.



Courtesy Sewage & Ind. Wastes

● SLOTS cast in gutter increase inlet capacity

Preparing Sewerage Facilities for Winter

Several State Sanitary Engineers have furnished information concerning their recommendations to the cities of their respective states relative to preparing sewerage systems for winter weather. Ohio's Dept. of Health recommends locating stoppages of sewers; and checking heating in pump stations. At treatment plants, provide maximum sludge storage space in digesters, drying and removing from the beds as much sludge as possible during the fall; change to winter lubricants, as recommended by equipment manufacturers; drain or pump out piping subject to freezing and provide anti-freeze solutions for for water seals; check the operation of heating equipment in plant structures; provide protection for flame traps or remove them during freezing weather, and protect exposed gas lines; place ice control materials ready for possible use in and around the plant, get the snow plow in shape and arrange with the street department to plow the plant out in case of very heavy snows.

From Illinois came the advice to check standby operating equipment and put it in good condition for service in case power lines are broken by ice storms. Maintain at least a 14-day supply of chemicals. See that all window glass is replaced, especially near water lines,

meters, etc. and remind consumers to do the same. Patch up cracks in the concrete of plant structure. Have equipment and materials available for controlling winter tastes and odors. Take steps to prevent formation of ice on settling tanks, as by raising and lowering the level in the tanks, or if this is not feasible, place logs in the basin.

From Iowa come additional suggestions—clean and repair siphons and siphon chambers; check distribution equipment on filters, and provide wind breaks around filters. Mound or ridge-and-furrow the sand on sand filters.

"Getting Water and Sewerage Facilities Ready for Winter". *Public Works*, August.

Oxygen Transfer In Oxidation Tanks

A study made in the hydraulics laboratory of Mass. Inst. of Tech. on the absorption of oxygen by a liquid through which air bubbles are rising resulted in a number of conclusions, some of which are that: The percent absorption per foot of depth is higher for lower depths than for larger depths. The total absorption increases almost linearly with depth. Increasing number of diffusers or otherwise decreasing size of bubbles, favors increased absorption from a given flow of air. Overall efficiency of air compression power increases with depth until diffuser losses can be materially reduced. The rate of absorption is a maximum at the point of bubble formation, steadily decreasing as the bubble rises; the bursting of the bubble at the surface probably causes some aeration.

"Basic Factors of Oxygen Transfer in Aeration Systems." By Arthur T. Ippen and Charles E. Carver, Jr., Mass. Inst. of Tech. *Sewage and Industrial Wastes*, July.

Revolution Rates Of Filter Distributors

The British Dept. of Scientific and Industrial Research has been studying, in connection with biological filtration, the effect of different rates of revolution of the distributors. Applying settled sewage at the rate of about 150 gpd per cu. yd of medium, rates of revolution were varied from 1 min. to 55 min. per revolution of a 4-arm distributor, and it was found that the BOD of the effluent was lower when the time was 30 min. or more than when it was less than 30. The best results measured by reduced BOD and higher concentration of oxidized nitrogen, were obtained within the range of 15 or 30 min. per revolution.

"English Research on Sewage and Industrial Waste Treatment." *Public Works*, August.

Construction of Sewage Lagoons

On August 1, 1953, 13 communities in North Dakota were operating sewage lagoons. On the basis of successful operation of lagoons during the past four years, officials of the State Dept. of Health have reached certain conclusions relative to the construction and operation of sewage lagoons. As a general figure, a 10-acre lagoon should be provided for about each 1,000 population. Another method of design provides a capacity about 200 times the daily sewage flow. A lagoon should be at least ½ mile, preferably a mile, from town, and ¼ mile from any farm building. In constructing a lagoon, it should be surrounded by a dike with an inside slope of about 4 to 1, 8 to 10

ft. wide, and with about 3 ft. of freeboard, with an overflow to a watersource or another lagoon. The optimum water depth is 3 to 5 ft. The sewage should be discharged into the center of the lagoon, slightly above the bottom. Maintenance consists chiefly of keeping vegetation on the dike cut short so as not to interfere with wind action, and preventing bank rats and other animals from undermining the dike. As for sludge deposit, it is estimated that, with 10 acres per 1,000 population, it will require 135 years to build up a 1-ft. layer of sludge in the bottom.

"Sewage Lagoons in North Dakota". By W. Van Heuvelin and Jerome H. Svore, State Dept. of Health, *Sewage and Industrial Wastes*, June.

Laboratory and Pilot Plant Studies

Trickling filters are the most popular devices used for treating organic chemical wastes but function successfully only when the design is based on experimental evidence. Realizing this, the American Cyanamid Co. has conducted a thorough investigation to determine the feasibility of treating its wastes by biological trickling filters. This included both laboratory and pilot plant studies. Laboratory study was considered necessary to obtain preliminary information on the direction to pursue and methods of treatment that have promise and furnish preliminary data for designing a pilot plant, but the results obtained cannot be applied to full-scale plant design. The functions of a pilot plant are to reduce the "ignorance" factor in existing knowledge; to obtain assurance of successful year-round operation under all conditions; and to obtain firm data for design of the plant most economical to build and operate. Later, a pilot plant can be used to investigate operating variables and methods.

"Treating Organic Wastes on Experimental Trickling Filters." By John F. Vogler, San. Eng'r, Am. Cyanamid Co. *Water & Sewage Works*, July.

Charges for Treating Industrial Wastes

As a general rule, industrial wastes that are not unusually strong, toxic or corrosive can be disposed of at less cost through a municipal plant than by means of a separate industrial waste plant. Frequently, dilution with normal domestic sew-

age makes an industrial waste much easier to treat. Occasionally, wastes from two or more plants tend to neutralize each other. Combining the wastes in a single treatment plant is likely to save money for all concerned, and in general, municipal operations will yield more regular and better results. The problem of cost allocation between industry and city requires careful study in each case but an equitable solution is nearly always possible.

"Service Charges for Industrial Wastes Treatment." By Richard Hazen. *Sewage and Industrial Wastes*, July.

Equipment for Sewer Maintenance

The Sewer Maintenance Division of Los Angeles, Calif. maintains about 4,000 miles of sewers and 800 miles of storm drains, with 75,000 manholes. This requires special equipment and trained crews. Trucks are used to carry not only tools and equipment but also the personnel. All small tools are carried in locked compartments. All trucks carry blinker lights. Six 4-man crews clean sewers, using balls, cones, drags and buckets, rods, hose, blowers and small tools. A large sewer rodding machine removes roots and bad stoppages and cleans culverts and catchbasin connections, and threads rods through badly clogged sewers. A 2200-gal. flushing tank is in constant use for flushing sewers on flat grades, using a 3-in. pressure pump if necessary. Before a large sewer is inspected, it is ventilated by use of a blower of 7500 cfm capacity or one of 3500 cfm. Some 300 to 500 manholes are checked daily for explosive gases by a special crew using a vacuum to suck the air from the manhole through a sniffing prod inserted through the pick hole in the cover. A trailer-mounted 5,000-watt generator with six floodlights is used for night work, inspecting large sewers and operating electric tools. There is also a spray unit for eliminating odors and mosquitoes in catch basins.

"Equipment for Sewer Maintenance." By Alvin A. Appel, Supt. of Sewer Maint. *PUBLIC WORKS*, August.

Stream Capacity For Self Purification

The author describes a method for determining quantitative relationships between organic waste loads put into a stream and the resulting dissolved oxygen depletion. Although the Streeter-Phelps approach to the problem has been the accepted standard for many years, the application of its equations involves a number of practical difficulties, chief among them being the high cost and difficulty of determining the time of flow between successive sampling stations along the DO sag curve, the large staff and laboratory required, and the fact that the "constants" k_1 and k_2 are not constant. It is believed that the proposed method can be useful in analyzing grab sample data collected on many streams. A reasonable number of grab samples for a range of stream flow conditions is necessary for acceptable accuracy of results. By using the grab sample technique, with this method of analysis, a small field force can collect sufficient data for analysis from a number of stream reaches during the warm weather period of the year and evaluate their pollution assimilative capacity.

"Analysis of a Stream's Capacity for Assimilating Pollution". By M. A. Churchill, Chief, Stream San. Section, TVA. *Sewage and Industrial Wastes*, July.

Other Articles

"Financing of Storm Sewers, Benefits and Responsibility as Related to." By C. S. Seabrook, San. Engr. Tacoma, Wash. Public Works, August.

"Drainage ditches for mosquito control are kept free of vegetation." "Chemical Weed Killers Improve Ditch Maintenance." By Wm. D. Hogan, E. I. duPont de Nemours. Public Works, August.

"Activated Sludge Plant. Taking the Bugs Out of the Boise." Details of breaking in a new plant. By A. J. Wahl, Supt. Wastes Engineering, July.

Digester ruptured by stoppage of all outlets by scum from packing house wastes. "Ruptured Digester Cover Due to Packing House Wastes." By V. A. Vaseen. Wastes Engineering, July.

"Bio-Aeration Plant, The Improved." at Sheffield, England. By J. H. Edmonson, Gen'l Mgr. Municipal Engineering, July 2.

"Tar Residue, Lurgan (Ireland) Sewage Purification Plant Will Treat." Municipal Engineering, July 2.

"Electroplating Wastes, Disposal of." By Charles A. Walker, Paul W. Eichenlaub, Walter Zabban, Raymond W. Southworth and E. P. Heslin, Yale University, Sewage and Industrial Wastes, July.

"Gravity Separation of Oil." By H. F. Elkin and W. E. Soden, Sun Oil Co. Sewage and Industrial Wastes, July.

"Phenolic Wastes, Microbiological Studies on the Treatment of Petroleum Refining." By Waldron D. Sheets, M. K. Hamdy and H. H. Weiser, Ohio State Univ. Sewage and Industrial Wastes, July.

"Radioactive Contaminated Laundry Waste and Its Treatment", by continuous flow over slimes. By Earnest F. Gloyna Assoc. Prof of C. E. Univ. of Texas. Sewage and Industrial Wastes, July.

• • •

Details of Building for Parking and Commercial Use

The off-street parking plan of the Philadelphia, Pa., Parking Authority provides for the use of the first floor of the building for commercial purposes, at a higher rental. Since some of this commercial space is to be air-conditioned, a special type of construction was used to provide insulation and water-tightness. A typical illustration of the construction is that employed at Project "B" which is a 4-story L-shaped structure at 10th and Ludlow Sts. Because of the air conditioning planned for the first floor area, part of the first floor parking deck, an area of about 10,000 sq. ft., was insulated with two inches of Foamglass, a cellular glass material.

Using this type of insulation, which has a safe compressive

strength of 100 psi, construction was started with a 5-inch reinforced concrete base slab. This was mopped with hot pitch and the Foamglass insulating blocks were laid with staggered joints. On top of this insulation, a 2-ply cotton fabric and pitch membrane was placed; and on this a 4-in. concrete wearing surface of 5-ft. square concrete slabs with half-inch contraction joints. The idea was to eliminate slab cracking, which might tear the membrane. This method utilizes also the high structural strength of the insulating material.

This Project "B" is said to be the first such garage in which electromagnetically operated controls and traffic signals are installed. A circular scissors ramp handles the up and down traffic in separated lanes and the traffic lights regulate the flow of cars to and from each deck. This complete control system, together with automatic ticket dispensers, does away with traffic bottlenecks. Designed for the convenience of short-time parkers, users can park and remove their cars without waiting for an attendant to move blocking vehicles.

Howard T. Scott is managing director of the Authority; the architects on this project were Harbeson, Hough, Livingston and Larson. Foamglass is a product of Pittsburgh Corning Corp.

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Methods of Handling Tree Trimmings

Eleven cities in the northerly portion of the Detroit metropolitan area two years ago created the Southeastern Oakland County Garbage and Rubbish Authority, which is now constructing a $1,500,000 incinerator to serve all 11 cities. Officials of the authority, anticipating that the disposal of tree trimmings and stumps would constitute a large volume of the waste materials, recently sent an inquiry to 39 large cities to ascertain how this problem is handled. As reported in Public Management, 33 of the 39 cities collect and dispose of shrubbery trimmings and tree limbs if properly bundled. Some cities place a limitation on the size or weight of the bundles, and a few collect shrubbery trimmings but not tree limbs. Only 14 cities collect and dispose of tree trunks and stumps and a fourth of the cities do not permit open burning of shrubbery and tree trimmings, although a few cities like Houston, Cleveland, Denver, and St. Paul permit burning during certain hours. Some 13 of the 39 cities dispose of shrubbery trimmings and tree trunks at the city incinerator, another one-third use the sanitary landfill method for disposal of trimmings, and the remaining cities use either open burning or open dump. Brush grinders or chippers are used to some extent in St. Louis, Milwaukee, Cincinnati, Kansas City, Oakland, Toledo, and Akron.

• • •

Cost Data on Bridge Painting by Contract

As a protective coating for bridges in the eastern and coastal regions of the State, Texas has been using a ready mixed aluminum grease paint. This requires less cleaning than conventional paints. In 1953, six contracts were let involving 84 bridges, the average bid price per ton of steel in the bridges being $4.58 for one coat of grease paint and a final coat of aluminum paint; in 1953, one contract was let involving 6 bridges, at a cost of $4.76 per ton. These costs were almost precisely the estimated cost for cleaning and applying two coats of conventional paint.

PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

Automatic Control Of Water Intake

Pendleton, Ore., obtains its water supply by gravity from a stream 15 miles away which at times becomes muddy; at which times gates in the supply conduit are closed and the supply is taken from deep wells within the city limits until the stream runs clear, when the gates are opened again. It was found to be humanly impossible to obtain precise surveillance and control by means of an intake operator, and this is now effected by means of a photoelectrically operated device, in which electric eyes continually observe the turbidity of the water at the intake and automatically close the gates when the light transmitted through the water falls below a certain limit and opens them when it returns to normal. To prevent false operation due to variations in light source intensity, dirty lenses, voltage fluctuations, two light paths of different lengths pass through the water, and the control is effected by the differences in the amount of light transmitted through these two paths.

"Electric Eye Never Sleeps; Constant Vigil Kept on Water Supply Turbidity". *Engineering News-Record*, July 22.

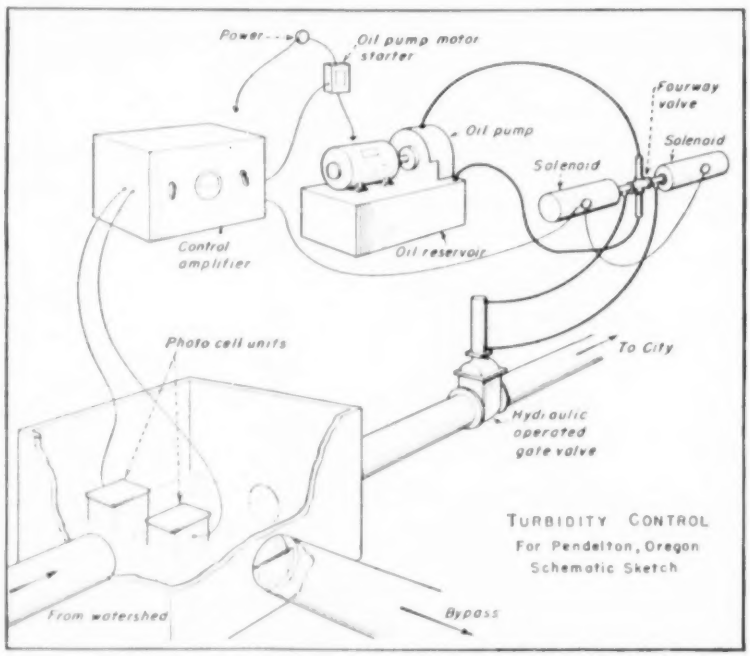
Combating Pipeline Growths with Chlorine

Palo Alto, Calif., supplements a well supply of water by an amount obtained from San Francisco's system. Since the connection of the latter to its system, red water troubles have been increasing, and it is believed that this was due to importation of crenothrix from the San Francisco mains. In 1951, Palo Alto began chlorinating all water entering the mains from either wells or the San Francisco system. It aimed to maintain 1.0 ppm in the distribution reservoirs and at transmission line connections. The residual, of course, decreased towards the distant parts of the system. At first, tastes and odors were most pronounced as the chlorine destroyed the bacterial growths, but were not noticed where the residual was not below about 0.4 ppm. The dead growths were flushed out of the mains systematically during a period of 3 months, when all complaints of red water ceased. From this experience it was concluded that: Free residual chlorination is an effective means of combating crenothrix infestation. A free chlorine residual can be maintained throughout an extensive distribution system (126 miles of mains in Palo Alto). The chlorine demand of the distribution system diminishes with time until a stable point is reached. Even though the crenothrix kill in the mains be satisfactory, tastes and odors may continue at consumers' taps because of the additional time required to effect complete kill in the service lines.

"Combating Pipeline Growths by Maintaining Chlorine Residuals Throughout a Distribution System." By George Y. Blair, Ass't Eng'r, Water-Gas-Sewer Div. *Journal Am. W. W. Ass'n, July.*

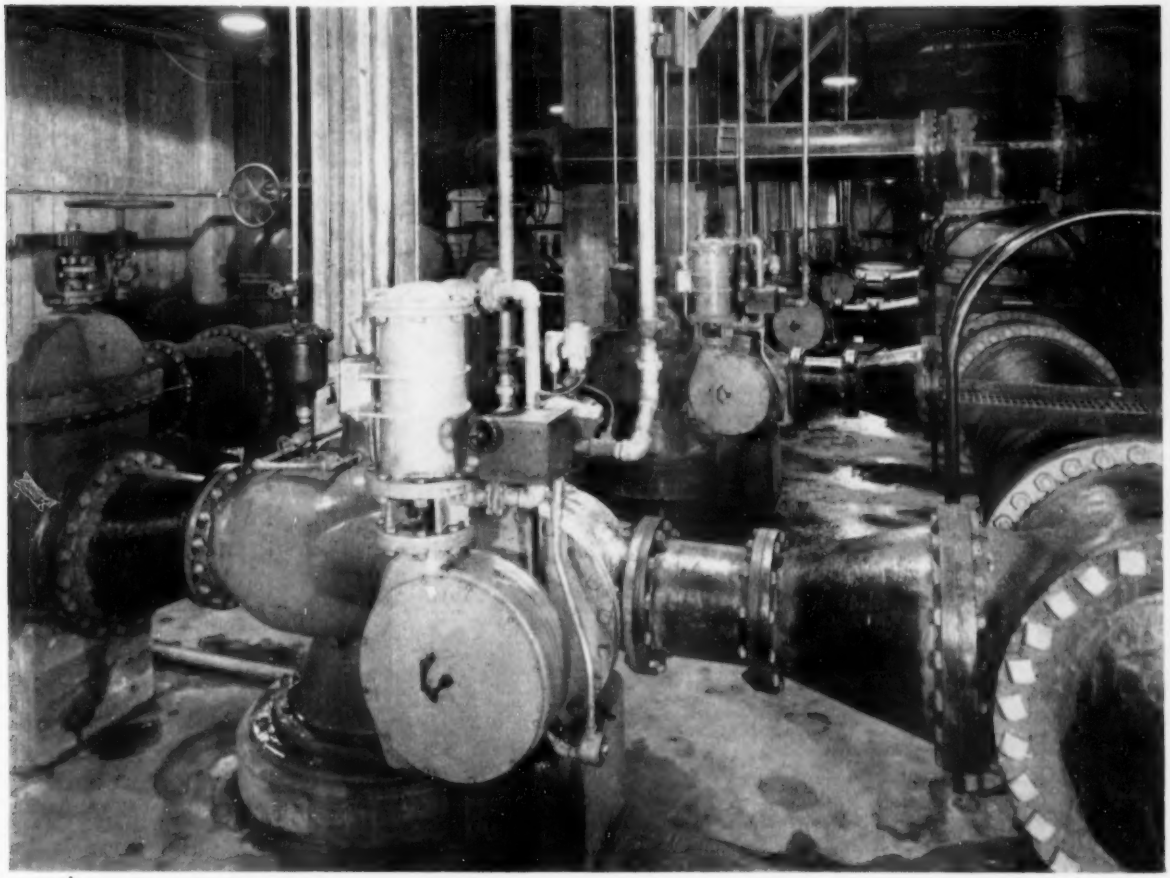
Selective Use Of River Water

Abilene, Texas, population 55,000, obtains its supply from two sources —three artificial lakes and the Clear Fork of the Brazos river, 12 miles away on the other side of a ridge. The lakes are the immediate source, water from the river being used as a supplementary supply. The lakes are hollows, surrounded by earthen dikes, which receive rain water from a watershed of 10,000 acres. The largest lake covers 3950 acres



Courtesy Engineering News-Record

● **PHOTO-ELECTRIC cell automatically shuts out turbidity.**



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and has a depth of 55 ft. The capacity of the three totals 30 billion gallons, but the rainfall is only 13 in. a year—much less some years—and provision has been made to draw on the river in case of necessity. The normal runoff to the river is 25 mgd. Unfortunately, the river water, for a short time after a rain, contains large quantities of salts washed from the drainage area. To avoid the necessity of removing them at the treatment plant, no water is pumped into the lakes from the river while its alkalinity is high. The alkalinity of the water is checked automatically and the operation of the pumps controlled by a Leeds & Northrop Speedomax Control. From May, 1952 to November, 1953, more than 3 billion gallons was pumped from the river.

"Rain Water for Abilene." By Guy Browning Arthur. *PUBLIC WORKS*, August.

Water Consumption By Air Conditioning

The problem of supplying the water consumed by air conditioning is becoming increasingly important. In 1952 about 10,000 residential air-conditioning systems were installed and 341,000 room air conditioning units. Within the next ten years the number of residential systems will probably reach several million. If the water use is conserved by cooling and recirculating, the amount used will not be so serious; but if it is not conserved, the amount used is about 20 times as great and would over-tax the available facilities in many plants. Moreover, because of the seasonal character and poor annual load factor of the service, unconserved air conditioning water is much more costly per gallon than water for other services; which would warrant a higher charge for such water. Some cities have set up demand charges for such water service; others restrict water use without conservation, based on a variety of factors. In some cases where the source of supply is inadequate, it may be necessary to prohibit non-conserved air conditioning.

"Meeting Air - Conditioning Growth." By C. K. Mathews. *Journal Am. W. W. Ass'n*, July.

Slow Sand Filters For Treating Springfield's Supply

The Springfield, Mass. water purification plant is one of the few in the United States that use slow sand filters. In 1909 the city in-

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stalled 6 such filters, and 4 more in 1924. By 1950 these were at times required to filter considerably more than 5 mgad, and in 1951-52 four more slow sand filters were added. The reasons given for not choosing the more commonly used rapid sand filters were that the water treated was a clear mountain water, and the cost of operating the slow sand filters was less than would be the cost of chemicals alone for rapid sand filtration; also, extensive modifications would have to be made for coagulating and settling, the cost of which would make the installing of rapid sand filters the more expensive of the two; the city owned plenty of land for slow sand filters; the operation of them is simple and well understood by the operating personnel. (Hartford, Conn. has adopted slow sand filters because the water treated is "relatively clear with some measure of uniformity in the turbidity and bacterial load" and the operation of slow sand filters is simple and low in cost. See the abstract "Washing Slow Sand Filters".) The latest filters are equipped with automatic rate controllers on the effluent lines, and with filter bottoms that permit filtration rates approximating 15 mgad. The new filters contain 1800 cu. yd. of filter gravel and 11,500 cu. yd. of sand. The total cost was $1,127,513.51.

"New Additions to West Parish Filters." By Peter C. Karalekas, Chf. W. W. Eng'r. *Journal, New England W. W. Ass'n*, June.

Acidization Of a Deep Well

The Cities Service Refining Corp. installed three wells at its Lake Charles refinery during World War II. As materials were scarce, the 110-ft. screens were made of 10-in. slotted carbon steel pipe. Each year since 1948 the static level of these wells has dropped from 5 to 15 ft. Also increased drawdown indicated poor condition of the screens or sand, and measures to clean one of them were taken in 1950; first by injecting 15% inhibited hydrochloric acid through the suction pipe and pump, and pumping out 30 min. later. A week later a second acidation was carried out similar to the first but with the reaction time increased to 3¼ hours. A third attempt was made 46 days later, differing from the others in that the acid was injected down a 2-in. line through a swab which distributed a more concentrated solution of the acid over 20-ft. sections of screen at a time. The acid this time was allowed to stand in the well for 18 hr. The drawdown of the well was improved by as much as 25 ft., and a year later the well was still in relatively good condition. It is believed that injecting chemicals through a swab in the screen is the most effective means of chemically cleaning a well. The construction of the swab is described in the article.

"Our Wells Resist Cleaning." By E. Clarence Oden and Charles E. Smith, Jr., Engrs., Cities Service Refining Corp. *Water & Sewage Works*, July.

Gas Burning Pump Engines

The Del Este Water Co. of California has, since 1946, been using internal combustion pump engines burning natural gas. The desired pressure in the distribution system is maintained within remarkably narrow limits by means of a diaphragm type of pressure regulator, practically eliminating surge. One of the principal advantages of gas engines as compared to electric motors

is the uninterrupted fuel supply. As to cost, at an average head of 180 ft. the gas fuel cost per 1,000 cu. ft. of water pumped is 4.5 cents, and the electric power 8.4 cents. The cost of maintenance and operation of gas engines is approximately 2.3 cents per 1,000 cu. ft. of water pumped for gas and 0.8 cents for electricity. For a 50 hp. unit, the installed cost of an electric motor would be about $750 less than that of a gas engine. Whatever the relative costs, the author prefers the gas engine because of the better service to customers it makes possible.

"Gas Burning Pump Engines". By K. H. Beard, Gen'l. Mgr. *Journal Am. W. W. Ass'n*, July.

Washing Slow Sand Filters

The water supply of Hartford, Conn. has been filtered through slow sand filters since 1922. At present there are 18 filter beds with a total area of 7½ acres. Each filter is washed every 9 or 10 weeks. Recently a new method of washing has been developed which reduced the sand washing costs 22% and the outage time 18%. This method consists of stirring up the sand and carrying the dirt away by a horizontal flow of water across the bed. The stirring device is a spring-tooth harrow drawn by a small crawler-type tractor, the teeth having a maximum penetration of 8 in. Harrowing is begun at the side furthest from the outlet drain, and the entire bed is covered six times in an 8-hr. day. The sand is allowed to dry over night and the next day it is harrowed in the dry, first with a disc harrow to a depth of 10 in., then with the spring-tooth harrow. The total wash water used amounts to ¼ of one percent.

"Washing Slow-Sand Filters With a Lateral Flow of Water." By Alexander J. Minkus, Eng'r of Purification. *Journal, New England W. W. Ass'n*, June.

Sea Water for Cation Exchanger Regeneration

Styrene-base exchange material is particularly well suited for use in ion exchange treatment where sea water is available for regeneration. When sea water is so used, the exchange capacity will generally be 40% to 60% less than if commercial salt were used, therefore the amount of exchanger used must be approximately twice as great; but the saving in operating cost quickly makes up the difference in initial cost. For this reason Ventura, Calif., adopted sea water regeneration for its two plants. However, it found it difficult to obtain the sea water from the surf, there being only a continuous beach at that part of the coast. For one plant, opposite a sandy beach, they sank a 4 x 3 x 30 ft. concrete box 6 ft. deep in the sand 22 ft. out from the mean low tide line. This has operated well for 3 years. The beach opposite the other plant is subject to considerable erosion and the intake was placed inshore. Wellpoints were selected as much cheaper than a concrete well with radial collectors. The screens on the wellpoints gradually became clogged, and finally a storm washed away the sand and gravel around them, and they are now being replaced with a radial collector system protected with steel sheet piling.

At present prices, softening by the lime-soda ash process would cost about $55 per million gallons; ion-exchange treatment using purchased salt, $26; the cost of pumping sea water has been $2 per mg of water softened.

"Sea Water for Cation Exchanger Regeneration at Ventura." By James

M. Montgomery. *Journal, American W. W. Ass'n*, July.

Radioisotopes In Columbia River

In 1945 production of plutonium was started at the Atomic Energy Commission's Hanford plant, located on the Columbia river. Water pumped from the river flows through the reactors and is returned to the river containing a complex mixture of radioisotopes. Relatively large amounts of these are short lived and quickly decay in large retention basins. Those reaching the river are diluted by a flow of about 250,000 cfs. The concentration is continuously assayed by the General Electric Co. and the radiation hazard evaluated. It is found that the radioactivity levels of the alpha and beta emitters in the river are well below 0.1 of the recommended maximum permissible concentration. So little radioactive material is deposited in fish that a person could eat 20 lb. daily without exceeding permissible radioactivity limits.

"Distribution of Radioisotopes in Columbia River." By Richard F. Foster and Royal E. Rostenbach, Radiological Sciences Dept., General Electric Co. Journal, *Am. W. W. Ass'n*, July.

Other Articles

"Settling Basin Cleanup." How Milwaukee cleans its two-deck settling basins. By E. F. Tanghe, Supt. American City, July.

"Modern Water Rates" in ten cities. American City, July.

"Watersheds, Quality Control of Water From." Controlling logging, road construction, farming and recreation. By Alfred T. Neale and E. P. Eldridge, Engrs, Washington Pollution Control Comm. Water & Sewage Works, July.

"Bathing Places, Joint Committee on." Progress report of committee of Am. Pub. Health Assn. Water & Sewage Works, July.

"Chlorination—A Ten-Year Review." By A. E. Griffin, Wallace & Tiernan. Journal, New England W. W. Assn. June.

"Meter Record-keeping Headaches, How We Cured Them." How Danville, Va., uses the Kardex system to replace over 100 meter reading record books. By Willard S. Jeffries, Chief Accountant. Public Works, August.

"Cambridge, (Mass.) Filter Plant, Improvement to Pumping and Filtration Facilities at." By Thomas R. Camp. Journal New England W. W. Assn. June.

Morse-type circular filter of steel construction. "The New Britain (Conn.) Water Filtration Plant". By I. Laird Newell, Research Chemist. Journal New England W. W. Assn. June.

"Steel Pipe Installations, Notable." By Julian Hinds, Gen'l Mgr. United Water Conservation Dist. Journal, Am. W. W. Assn. July.

"Colorado Springs Gets Water From Western Slope" of the Rocky Mountains by a tunnel 7,783 ft long. By G. R. Scott, D. P. Proudfit and M. Hemker. Water Works Engineering, July.

"Radioactivity Instrumentation and Testing, Progress in" Committee report. Journal Am. W. W. Assn. July.

"Strontium and Calcium in Municipal Water Supplies" By George V. Alexander, Ralph E. Nusbaum, and Normal S. MacDonald, Atomic Energy Project, Univ of Calif. Journal Am. W. W. Assn. July.

"Monobed Deionization, Studies of." By N. Krishnaswamy, Nat'l Chem Lab of India, Journal Am. W. W. Assn. July.

"Utility Radio, Experiences With" A joint discussion. Journal Am. W. W. Assn. July.

"Stream Pollution Control in Indiana, Progress of" By B. A. Poole, Stream Pollution Control Bd., and Ralph H. Holtje, State Bd. of Health, Indiana. Journal Am. W. W. Assn. July.

"Power for the Water Works System" Comparison of the different systems. By Glenn C. Boyer. Journal Am. W. W. Assn. July.

How Alabama Uses Aerial Photographs For Highway Location Study

This article is from a paper presented by F. W. Weldy of the Alabama State Highway Department at a meeting in Montgomery of ASCE. It was published in the Alabama Highway Bulletin, official publication of the State Highway Department.

THOUGH the Alabama Highway Department has been using aerial photographs for more than 30 years, it has been only recently that full use has been made of this method. Now each of the four state-wide locating parties and the Montgomery office are equipped with pocket and mirror-type stereoscopes; the six division offices have mirror-type stereoscopes; and there is one floating dot type contour finder.

Our general procedure is to order photographs for all "cross county" locations, or for relocations for correcting sections having substandard alinement. In fact, about the only location surveys we would not secure photographs for would be in cases where it is mandatory that the proposed improvement follow along, or very close to, an existing important highway or street.

In order to get the fullest advantage from photographs in making a location survey, the ideal procedure is to secure them 30 to 60 days before moving a survey party in to do any work on the ground. This permits the party chief and one member of his party to handle the preliminary work intermittently, while the balance of the party finishes a previous survey.

We begin work with the photographs by forming the contact prints into an uncontrolled mosaic. The longer the project to be located, the more careful we are in forming the mosaic. The contact prints are first matched by flight lines and fastened in place securely, but temporarily; then flight lines are matched to flight lines and these are fastened together also. We have recently found it desirable to secure the Index photograph, which is a picture of an approximate mosaic, made on varying scales of 1" to 2" equaling 1 mile. This is done particularly for projects longer than 8 to 10 miles, in view of the fact that considerable time can be saved in forming and re-forming mosaics.

After the mosaic is formed, we spot the terminals and definite controls, between terminals, if any, and draw a red line directly through these points. The mosaic is then very carefully taken apart, and during the process of separation, the red line is produced completely across each photograph touching the line.

The stereoscopic study of the terrain begins first along the red, or direct, line. The drainage patterns, stream crossings, railroad and highway crossings, and topography, are studied very carefully. After study of the area along the direct red line, we begin selecting a route and laying a line in another color along the most favorable terrain, clearing important structures, selecting the most favorable railroad and stream crossings and yet not wandering more than necessary off the direct course between controls and terminals. If one or more alternate routes appear necessary, other lines in different colors are drawn.

All lines, in like colors, are then very carefully transferred to, and placed on, the enlargements by definite images as controls. We now

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150 North Wacker Drive, Chicago 6, Ill.
79 McAllister St., San Francisco 2, Calif.

prefer using one inch equals 400 feet scale enlargements rather than the one inch equals 660 feet. These are more expensive; but it is well worth the additional cost to have the photographs with a scale the same as the scale generally used on our location field maps.

With photographs in hand, we go to the field and follow each line out on the ground. This is easy to do. Each line is very carefully studied on the ground, and all features of advantage noted or spotted on the photograph. Any needed distances may be measured by scale on the photograph or, in some instances, by tape on the ground. In rough terrain we use the contour finder to determine actual differences in elevations at particular control points. From this accumulation of data, we are usually able to project a line very close, if not directly on, the final location. Unless we are in very rough country, we can usually eliminate all alternate routes during this process.

We are now ready to begin running and actually staking the line; and, if deemed necessary, running alternate lines on the ground. First "hub" lines are run throughout the length of the project, identically as projected on the photographs. The "hub" line is studied and in places slight adjustments made. Second, the lines are run with all curves run in and stationed off as we ordinarily stake final location alinement. The level party follows closely after the stationing, taking profile levels, more particularly through rough terrain, such that the minor changes in alinement, usually more definitely indicated by profile, may be made before the stationing gets too far ahead. There are very few cases where contours are necessary for fixing the location alinement, and usually the areas to be contoured are small. Where such contours are required, we take them from the ground, because contours taken from photographs may be off actual elevations as much as two feet.

After the final location center line is established, all drainage areas in rolling, hilly and mountainous terrain, are determined in the office with the stereoscope on the contact prints, using a particular colored wax pencil for drainage areas only; and then the areas are transferred to the enlargement for area measurement. This method is definitely dependable in any terrain rolling enough so that dividing ridges can be well defined under the stereoscope. In flat terrain, each drainage

ground with the enlargement photographs in hand so that drainage dividing lines can be drawn on the enlargements.

Generally, stream meanders are taken from the enlargements. In a very few places we may find the swamps too thick around smaller streams to define the exact stream bed on the photograph.

The most advantageous feature in our use of the aerial photographs on location survey work is the stereoscopic study—being able to see the third dimension, or depth, generally referred to as "relief" over such a wide spread area at one setting of the minor type stereoscope.

We save considerable survey party time in running the otherwise numerous preliminary lines, determining drainage areas and securing stream meanders. I would say that for the average "cross country" location survey, if we get the photographs 30 days or more in advance, we would save at least two survey party days per mile. Our regular locating parties consist of 8 to 10 men per party and the costs of one party per day runs from $135 to $150.

We eliminate damaging timber in wooded areas; and the photographs give valuable information as a lead or guide in locating property and section line ties. We do not disturb as many property owners in that fewer lines are run.

In selecting a new route through areas of very rough terrain, we feel satisfied that our location, when selected with aerial photographs, is along the best route and is properly fitted to the terrain for the most economical construction.

• • •

Philadelphia to Eliminate Open Refuse Dumps

With a view toward eliminating the burning of refuse in open dumps, by the end of 1955, Philadelphia plans the erection of two new incinerators and the expansion of the three present plants, making changes which will insure that operations will comply with the city's air pollution ordinance.

• • •

Texas Uses a Lot of Asphalt for Its Roads

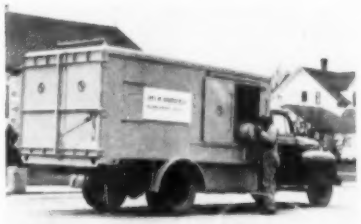
According to the State Highway Department, about 85 million gallons of asphalt were used last year on Texas roads. The average delivered price was about 10 cents per gallon.

PUBLIC WORKS
EQUIPMENT NEWS

Published Monthly **September, 1954**

Compacting Garbage Body for Smaller Motor Trucks

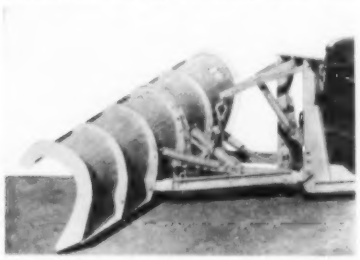
Specifically designed to provide maximum payload on a minimum size truck, the M-B Corp. has brought out the Packer Body. By means of a simplified but efficient compaction system, 14 to 16 cu. yds. of compacted refuse can be handled on a 2-ton or smaller truck. The body is square shaped, van-type and the packer plate is mechanically operated. This unit is intended to permit the smaller communities to have modern and efficient collection methods. The load is power-ejected; the body is not up-ended. Boxes, crates, steel drums and normal refuse are all compacted. Operation is simple and all possible safety features are incorporated. More from M-B Corp., New Holstein, Wisc., or circle No. 9-1 on the coupon.



Packer garbage body by M-B Corp. handles big loads on a small truck

Davenport-Frink Announces Universal Underbody Hitch for Snow Plows

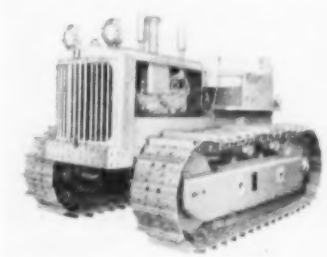
Of very strong all-welded steel construction, the universal underbody hitch announced by Davenport-Besler Corp., is completely adjustable, easy to mount and remove. It has a 3-point suspension which permits free pivoting to avoid damage or dangerous stresses to the truck frame and hitch when working on irregular surfaces. There is a generously designed rubber shock absorber, between the universal hitch and the rear frame cross tie, which dampens impact shocks and provides full protection for hitch, truck and driver. An exclusive method of bolting eliminates the thrust on the front axle. This unit is described in Bulletin UH-1. There is also available a complete bulletin on the Davenport-Frink one-way blade "Trip-Rite" plows. Write Davenport-Besler Corp., 2305 Rockingham Road, Davenport, Iowa, or circle No. 9-2 on the coupon.



Rugged underbody hitch with "Trip-Rite" release mounts plow safely

Most Modern and Powerful Torque Converter Tractor

Early last month, International Harvester announced the new TD-24 torque converter crawler tractor, with 200-hp engine, said to be the most powerful torque converter crawler. Designed primarily as a push-loading tractor, it can be used for any heavy work. Gear-shifting is not required; speed and power are increased by opening the throttle. Dimensions are the same as on the standard TD-24 and all attachments are interchangeable. Weight is a little over 43,000 lbs. More from any IHC dealer, from International Harvester Co., Chicago 1, Ill., or Circle No. 9-3 on the coupon.



Powerful torque converter tractor (right) smooths push loading work

ATTACHMENT FOR CHAIN SAW SPEEDS BRUSH CUTTING JOBS

Full power of the chain saw can be used for cutting brush with this "brush-cut" attachment. Quickly attached to standard Lombard saws, both hands of the operator are free for complete control of the cutter; the weight is nicely balanced for easy operation. Write Lombard, 65 Main St., Ashland, Mass., or circle No. 9-4 on the coupon.

Brush cutting chain saw attachment is light weight, has easy operation

• • •

First airborne crane for Army engineers. The Wayne Crane Div. of American Steel Dredge Co., Fort Wayne, Ind., has been awarded a research and development contract which covers a new type of self-propelled, rubber-tired airborne crane, by the Corps of Engineers, Fort Belvoir, Va. Weight will be 16,000 lbs.; length 37 ft.; width, 8 ft. 4 ins., and 6 ft. 9 ins. high.

Windrow Loader Handles 4 to 7 Cu. Yds. per Minute

Barber-Greene's new model 550 Windrow Loader cleans up snow at 7 yds./min.

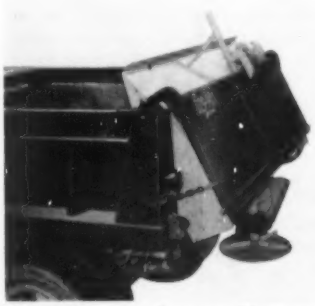
In the months just ahead, in our northern states, this unit can have tremendous value in handling snow; elsewhere, it has wide applicability in highway and similar construction work. Capacity in snow removal is 7 cu. yds. per minute; in handling construction materials 4 or more yds. Highly maneuverable, it will turn around in an 8½-ft. radius. Travel speed is 10 mph. Discharge height for loading is 10 ft., with an overhang of 8 ft. Basically, the unit consists of a loading belt conveyor boom and mechanical feeding mechanism mounted on a John Deere Model 50 tractor. Over the past two years, a number of pilot models have been operated under realistic test conditions—in northern Michigan on snow and ice; in Georgia on wet sand and clay; in Texas on sand, loam and broken rock; in Illinois on earth and sand containing roots and stones. More information from any Barber-Greene distributor, from Barber-Greene Co., 400 N. Highland Ave., Aurora, Ill., or by circling No. 9-5 on the coupon.

Hydraulic Spreader Can Cover Four-Lane Highway

Positive self-feeding of all materials from powdered lime or cement, salt, sand and cinders on up to 1½ in. crushed rock features the new 1954 Century Hydraulic Spreader, according to the manufacturer, Century Engineering Co. This new spreader—called Posi-Feed—does not depend upon gravity flow from the truck to the spinner for ice control work; instead, an auger and agitator operating inside the truck body provides positive feed, prevents channeling and breaks up frozen lumps to spreading size.

No bolts are needed for mounting; the feeder drops into the truck body and is held securely by the chained tailgate. It is adjustable to any height and the spinner is always level with the roadway regardless of the truck body angle. It will not spread on passing cars or pedestrians yet it will cover any width in any direction from a few feet to a 4-lane highway. With one-man operation, complete control even to intermittent spreading at bus stops or intersections is by finger tip knob on the instrument panel.

The spreader is quickly convertible to a sealcoat unit which will spread any material up to a 10-foot width. More from Century Engineering Co., Waukesha, Wisc., or circle No. 9-6 on the coupon.



Hydraulic spreader provides positive feed, controls spread up to 4 lanes

For Cleaning and Developing Water Wells

Calgon has been used with much success for cleaning wells. Now Calgon has brought out "Weltone," a chemical preparation which contains (1) Calgon, the water conditioning agent; (2) a disinfecting agent; (3) a wetting agent; and (4) other chemicals to improve the well cleaning process. It is said to remove minerals deposited on the screen, as well as clay and silt. It will not harm metals or concrete; and it does not generate dangerous fumes. More from Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa., or circle No. 9-7 on the coupon.

Oliver Announces New All-Purpose 4-Wheel Tractor

Said to be the most powerful of its type, Oliver's new Super 55 tractor, provides great versatility along many lines. Front and rear wheel

New all-purpose tractor, the Super 55, introduced by Oliver Corporation

tread is adjustable from 48 to 76 ins.; weight is 3300 lbs.; there is a choice of two engines, high-compression gasoline or diesel; there are six forward speeds. Standard equipment includes a 3-point hitch and internal hydraulic system designed to accommodate the full line of attached implements. An independently controlled power take-off is available. More from Oliver Corp., 400 West Madison St., Chicago 6, Ill., or circle No. 9-8 on the coupon.

Excavators with torque converter drive. Torque converter-engine combinations are now available as optional equipment on certain models of Bucyrus-Erie excavators. They provide maximum (stalling) torques from 200% to 225% of full load torques of straight friction drive for a given excavator. They provide a cushioning effect to protect the machinery and engine from the shock loads encountered in excavator operation. Bucyrus-Erie Co., South Milwaukee, Wis.

Windsor Pavement Cutter Handles Blades 12 to 22-in. Diameter

Using a 26.8-hp motor and Windsor diamond blades, 12 to 22 ins. in diameter, this machine fills all needs for pavement cutting. A cooling and flushing system removes all loose abrasives from the cut. Special features are the control of depth of cut, the heavy welded frame and the hydraulic system that balances the machine for easy handling. A front pointer automatically maintains cutting position. More from Windsor Machinery Corp., 61 Airport Road, Hartford, Conn., or circle No. 9-9 on the coupon.

Clean pavement cuts with closely controlled depth are made by this machine

Angling Bulldozer for Use With Crawler Tractor

An angling bulldozer for use with the John Deere "40" crawler tractor is ideal for municipalities, contractors, lumbermen, etc., for dirt moving, land clearing, road grading, snow clearing, filling, ditching, and many other dozing jobs. The blade and the moldboard are curved to roll instead of push the dirt. The blade can be angled 11½ and 25 degrees to the right or left, or used straight, the angling being accomplished by changing two bolts from one hole to another. Complete details from John Deere, Moline, Ill., or circle No. 9-10 on the coupon.

"Sucker-Upper" Does a Job of Leaf Removal

This Elliotte vacuum leaf loader does a complete job of leaf removal and also picks up such debris as cans, bottles, sticks and paper. Its use reduces catch basin and sewer cleaning jobs; reduces man and machine hours; and saves a lot of wear and tear on machines not intended to be used for leaf removal. Mounted on a trailer, it has its own engine and is truck towed. More from Gledhill Road Machinery Co., Galion, O., or circle No. 9-11 on the coupon.

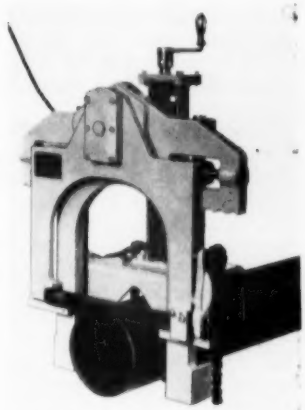
Vacuum leaf loader lifts leaves and debris with powerful suction nozzle

Better Nighttime Visibility with this Marker

A red and silver marker for bridge-ends and culvert abutments, completely reflectorized for nighttime visibility is made of aluminum and is faced with "Scotchlite" reflective sheeting. It is claimed that these signs are visible up to a half mile away, despite heavy rain and regardless of the angle of approach. The marker is diagonally striped and is 8 ins. by 36 ins. It is said that the marker needs practically no maintenance. More from the Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6, Minn., or circle No. 9-12 on the coupon.

Portable Power Saw For On-The-Job Cutting of Cast Iron and Steel Pipe

Here is a portable power saw for on-the-job cutting of cast iron and steel pipe, 2 to 8-in.; also it will cut bar stock and beams. It weighs only 120 lbs. and operates in a space 25 ins. wide.; it cuts in a matter of minutes—6-in. standard c. i. pipe in 4 mins. A chain pipe vise clamps the saw to the pipe, ready to make the cut. Square cut is assured. More from E. H. Wachs Co., 1525 N. Dayton St., Chicago 22, Ill., or circle No. 9-13 on the coupon.



Guillotine pipe saw handles 2″ to 8″ c.i. and steel pipe

Snow Thrower Can Cover 2400 Sq. Ft. per Minute

This is a new and larger Maxim snow thrower and it has been designed to meet the needs of cities in quick snow removal. It cleans a 4-ft. wide strip and will operate at 600 fpm. It turns in a 10-ft. radius, and will readily climb an 8-in. curb. It will handle dry snow to 32 ins. deep. It is mounted on the Allis-Chalmers G tractor, and the snow thrower is quickly removed so that the tractor can be used for other jobs. More information on this unit from Maxim Silencer Co., Hartford, Conn., or circle No. 9-14 on the coupon.

Compact and maneuverable snow thrower cleans walks, streets and roadsides

Drills Concrete and Masonry at High Speeds

Using a simultaneous hammering and rotating action, the Demo drill is operated by one man and will drill holes 3/16 to 1½ ins. in diameter, horizontally or vertically, in reinforced concrete or masonry. Coupled core tubes enable the drill to penetrate to a depth of 40 ft. Current used is 115-volt, with no transformer or rectifier. Weighs only 9½ pounds and has low noise level. More from Demo Tool Corp., 8735 Melrose Ave., Los Angeles 46, Calif., or circle No. 9-15 on the coupon.

The new diesel power unit, the UD-1091, by International Harvester Co., replaces the UD-24. The engine produces 203 intermittent hp or 162.4 hp at 1400 rpm. Net maximum torque is 793 lbs. at 1000 rpm. The unit is skid mounted and is available with or without radiators, with air or mechanical throttle and clutch controls, and various gear ratios for power take-off speeds above or below rated engine rpm. International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

Bottom Dump Trailer Cuts Road Costs; Speeds Hauling and Spreading

Doubling the speed of any spreading operation is possible with this new bottom dump hauling and spreading trailer, according to the manufacturers. It has a hauling capacity of 10 to 12 cu. yds., and it spreads gravel and other similar materials "on the run," enabling spreading operations to proceed at full speed; and it requires only one man for operation. It is tractor drawn. For more data on this Timpte Gilpatrick Cross dump trailer, write to Timpte Bros., Dept. EE, 40th & York Sts., Denver, Colo., or circle No. 9-16 on the coupon.

Double speed in spreading operations is claimed for this bottom dump wagon

Fully Convertible Half-Yard Shovel

An entirely new half-yard power shovel has been announced by P & H. This is an all-purpose machine, convertible to shovel, hoe, clamshell, dragline, crane and magnet. Compact and easy and quick to handle. Data from Harnischfeger Corp., (ask for Bulletin X-149, just issued), 4603 W. National Ave., Milwaukee 46, Wisc., or circle No. 9-17 on the coupon.

½-cu. yd. crawler mounted shovel announced by Harnischfeger Corp. (right)

Improved 105 cfm utility compressor. Put back into the Le Roi Airmaster line, the new unit has several improved features including better air cleaning and cooling through the use of oil bath cleaners and a pressurized cooling system. It is ideal for mounting crosswise behind a truck cab, allowing plenty of extra room for other equipment and materials. Overall width is only 25 ins. and overall length 82 ins. It is light and compact. By using the lifting bail, it can be moved from a truck and back again very quickly, no disconnection or disassembly being required. Le Roi Company, Milwaukee 14, Wisconsin.

Electric Generating System for Tractors

An experimental electric generating system has been designed for use on farm tractors by International Harvester Co. With this unit, the tractor can be utilized as a source of electrical power and can drive saws, supply temporary lighting, operate pumps and run other tools. Power can be supplied in 220 and 120 volt. This unit is not yet in production; however, it is also being applied experimentally to motor trucks.

The "Work Horse" industrial loader is designed for the Fordson major Diesel tractor. Available attachments include a 4-ft. tined bucket, 4-ft. material bucket, 6-ft. bulk material bucket, a dozer blade, and an 8-ft. boom. It is equipped with a ⅜ cu. yd. (heaped capacity) bucket; has a 3500-lb. breakaway capacity, and a 2000 lb. maximum lift to full height of 10 ft. 6 ins., with a dumping clearance of 9 feet. Specially designed for operation in confined areas. The Johnson Hydraulic Equipment Co., 515 W. 78th St., Minneapolis 23, Minn.

Cleveland Trencher for Pipe Lines and Heavy Work

Designed for heavy-duty work, this new Cleveland Model 240 is a crawler - mounted, wheel - type trencher which digs up to 36 ins. wide and down to 75 inches deep. It has low ground bearing pressure —only 6.3 pounds per sq. in.—and it is said to be perfectly balanced. These features permit fast and effective work in wet ground and on bad hills. Three bucket widths are available, up to 26 ins. wide. Overall length is 24½ feet and width 8 ft. Write Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio, or circle No. 9-18 on the coupon.

A new type of paint mixer, the Airomixer, by Wald Industries, Inc., Huntington, Pa. This mixer uses a 2-way, Turbu-Dig action to loosen settled paint pigment and get it back into suspension. It is portable and splashless and uses a suction-type impeller. The electric or air-driven, explosion-proof motor guarantees safety when working around paints and lacquers.

Excavator with 20-Ton Lift Capacity Uses Five Attachments

A new excavator in the 20-ton lift class has been announced by Koehring. Crawler-mounted, it is available with five cost-saving attachments. Shovel and hoe have buckets of 1-yd. capacity; digging depth of the hoe is 22½ ft. Clamshell and dragline bucket size depends on material to be handled. For details of many improvements, write Koehring Co., 3026 W. Concordia Ave., Milwaukee 16, Wisc., or circle No. 9-19 on the coupon.

Handy Small Size Electric Power Plant and Water Pump

Highly portable, since it weighs only 50 pounds, this unit will supply 700 to 1000 watts of AC current and, in addition, will perform numerous everyday pumping jobs; also it will charge 6 or 12-volt batteries. Pumps up to 360 gph, up to 30 lbs. pressure. Engine is 2 hp. Write Trailite Corp., Three Lakes, Wisc., or circle No. 9-20 on the coupon.

Right-hand drive is now available for International trucks and conventional cab design built at the company's Fort Wayne, Ind., and Springfield, Ohio, works, except diesel-powered models. It is not available on Internationals with Metro (R) bodies, International Western-built models, or Fageol Vans. Trucks requiring the driver to operate from the right-hand side of the seat include rural mail delivery, roadside spraying, street sweeping, etc.

A 5000-watt air-cooled lightweight electric plant, the 5RM61, has been announced by Kohler Co., Kohler, Wis. This model is designed

Portable air-cooled electric plant developed by Kohler delivers 5000 watts

for installations where a liquid-cooled unit is not practical. Powered by a Kohler K660 engine (2-cylinder opposed, 4-cycle air-cooled), the new plant is available in a 115-volt or 115/230 volt single phase AC models, with either manual or remote starting. Because it is air-cooled, anti-freeze is not necessary for cold weather operation. A muffler, oil bath air cleaner and oil pressure gauge are also included. Optional accessories include two six-volt starting batteries for remote starting models. The weight is approximately 480 pounds.

"Veon" is a traffic control line that can be laid without interrupting the normal flow of vehicles. Laying of the lines can be done between traffic light changes, and the lines can be traveled over immediately without necessity for further drying time. There will be no distortion, no "pick-up" and no damage to the lines by this immediate use. Tests indicate that "Veon" will last as long as the surface of the road to which it is applied. An integral part of the new process is the mechanical equipment for laying the line with a one-man operation, which was designed by Broadway Maintenance Corp., 22-09 Bridge Plaza, Long Island City, N. Y.

Transit Crane and Mobile Crane-Excavator

For fast and efficient handling of small jobs, Bucyrus-Erie has brought out the 15-B crane. The standard crane boom is 30 ft. long, but is extendible to 70 ft. by using removable inserts. This machine is mounted on rubber tires. It is readily convertible to a half-yard shovel, dragshovel, clamshell or dragline. More from Bucyrus-Erie Co., South Milwaukee, Wisc., or circle No. 9-21 on the coupon.

The Turbo Jet power leaf mill pulverizes leaves, reducing them to a granular consistency. In normal operation, this chaff is blown into the grass as the machine is working to provide an almost invisible mulch. Attachments are available for collecting and bagging the chaff for later use as a mulch. It will remove leaves from ivy beds, around

Fine leaf chaff produced by the Turbo Jet power leaf mill seen in background

fences, and other hard-to-reach places; it will clean up to 10-feet swaths at one time. The Turbo Jet Manufacturing Co., 22 Bowman Terrace, Cincinnati, 29, Ohio.

Quickly Backfills Curbs and Trenches On Widening Work

This is a hopper conveyor which is attached to a hauling unit and used for filling along curbs or on widening projects. Attachment and

Hopper conveyor discharges fill from truck to ditches, curbs and trenches

release are quick and easy, and the removal of the conveyor assembly permits use of the hopper for full-width spreading of salt, cinders, gravel, etc. Capacity is 3 tons per minute. Write Power-Pack Conveyor Co., 13910 Aspinwall Ave., Cleveland 10, O., or circle No. 9-22 on the coupon.

This high-speed industrial tractor is adaptable for towing and material handling; for towing aircraft and for cleaning snow from runways and aprons. It is good for small hauling scrapers and bulldozers, backfilling and other jobs. All-wheel drive, the weight is well balanced between the front and rear axles. American-Coleman Company, Littleton, Colorado.

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The easytouch disc-type servo hoist-clutch is now installed on the O-G Model 320, 322, 325 and 327 machines of Osgood-General. With the hand or foot throttle, it is possible safely to hold a load in mid-air, or "inch" it up or down, the throttle controlling the input speed of the converter and matching its output power against the line pull. The "easytouch" mechanism is standard equipment on the Model 322, 25-ton truck crane, and optional on the model 325 Mobilcrane, and crawler crane models 320 and 327. The torque-converter and foot throttle are optional equipment on all models. Osgood-General, P. O. Box 515, Marion, Ohio.

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Editor, Public Works Magazine; formerly Chief, Sanitary Corps, U. S. Army

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Qualifications: Age 30-50 with a B.S. degree in Engineering, or equivalent experience; some experience in traffic surveys and origin and destination analysis; those with some experience in design preferred.

Starting salary will range from $300 to $400 per month depending upon experience.

For further information contact:

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An extra heavy duty brush saw, the Wilton 4C, is manufactured by the Williams & Hussey Machine Corporation, Milford, N. H. Among the many new features are a new type base which provides a broader footing, a metallic air filter that will not foul, and a flexible gas line. Overall weight is low and design permits easy cleaning.

New higher r.p.m. continuous ratings for Cat D337 and D326 engines and electric sets in both self- and externally-regulated types have been announced by Caterpillar Tractor Co., Peoria, Ill. These engines are now available for continuous operation 24 hours a day at 1800 r.p.m.

All-weather direct electric starting with newly developed glow plugs will be available for the D4 track-type tractor of the Caterpillar Tractor Co., Peoria, Ill. This completely automatic push button starting unit provides positive starting with fingertip control from the D4 tractor seat.

The Jayflo light-weight pump, powered by an Onan 2-cylinder air-cooled gasoline engine, weighs only 190 lbs. This 10-hp unit delivers at 55 psi over 200 gallons per minute, thus pumping more than its own weight in water every 8 seconds with the low fuel consumption of less than one gal. of gasoline per hour. Available in skid mounting or trailer mounting. The major castings are of aluminum with stainless steel used in the crankshaft extension, the critical seal components and exhaust primer parts. Jayflo Products Co., 5167 Idaho Ave. North, Minneapolis 22, Minn.

A new model contractor's pump, the 32F-AKN 10 M, has been announced by Gorman-Rupp. It is of self-priming centrifugal design and will pump 166 gpm with a 10-ft. lift. The weight is from 160 to 200 lbs., and it has a 6.1 hp engine at 3200 rpm. Gorman Rupp Co., Mansfield, Ohio.

Medium and heavy duty Streng-Arm hoists are new additions announced by Gar Wood Industries, Wayne Div., Wayne, Mich. Dumping angle is 55°. Basic body models are available with extras, including cab protectors, hinged steel extension sides and wheel housings.

An all-drive rubber-tired tractor for road-building, construction, and other heavy work, by Garrett Distributors, Enumclaw, Wash. This is a conversion of an International

TD-6 and is in the 30 drawbar hp class, with a speed of 8 mph. Weight, 13,060 lbs., with winch, bulldozer blade and driver's canopy. Tires are of the type used on farm tractors.

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Portable Aluminum Pipe Line Carries Compressed Air

On the construction of the Roanoke Rapids dam, some 8500 ft. of 6-in. aluminum pipe is being used to supply compressed air to the drills required for the excavation of about a million yards of rock. Couplings are of aluminum alloy, furnished by R. M. Wade Co. The pipe weighs only 27 lbs. for a 20-ft. length, permitting easy handling and coupling by one man. Air pressure is about 105 psi.

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State and City Cooperation on Highway Problems

"In my opinion, State-City cooperation is not difficult if we work at it," said D. C. Greer, State Highway Engineer of Texas. "Let me stress the point that there must be a lot of give and take. Engineers must not crusade, but must be flexible enough to recognize the point of view of the other political sub-division. For instance, the State and Federal problem may be traffic and traffic alone. The City problem may be traffic plus blighted areas, slum clearance, recreation, etc. There is an even ground that can be found. We should operate as partners in a business, or as brothers in a family. Brothers do not always get along and they are quite often required to get out behind the barn and fight it out, but then generally they stand united. I say from experience that this same principle can be applied to State-City cooperation, and it will work."

NEWS OF ENGINEERS

Wellington Donaldson, well and most favorably known to many in the sanitary engineering field, retired from service with the city of New York on Aug. 1. He had been with the city since 1935; and previous to that time he was with Fuller & McClintock, the American Water Works & Elec. Co. and the Birmingham Water Co. His broad background of knowledge and his sound judgment combined to make him a leading figure in many phases of sanitary engineering. In sending us, at our request, a record of his service, he says: "You would never be able to guess how much fun these varied assignments over the years have been to me." To which we say: "Spoken like a true engineer by a true engineer."

John S. Flockhart has been made Administrative Assistant to the Mayor of Newark, N. J. Mr. Flockhart, who has been with Newark for many years in engineering capacities, recently has been serving as Chief Engineer of the Department of Public Works.

Dr. Victor L. Streeter will assume his duties this month as Professor of Hydraulic Engineering at the University of Michigan. Until this spring, Professor Streeter was at Illinois Institute of Technology and previously he had served as hydraulic engineer with the Bureau of Reclamation and the International Boundary Commission. A graduate of Michigan, he holds the degrees of BS (CE), MSE and Sci. D.

William T. Ingram has established an office as consulting sanitary engineer at 20 Point Crescent, Whitestone 57, N. Y., and will also maintain laboratory facilities. He will retain his association with New York U. In addition to water, sewage and refuse, he will handle air pollution control and industrial hygiene and safety.

Edward E. Bigelow has been appointed assistant engineering manager of Stone & Webster Engrg. Corp., Boston. He is a specialist in structural engineering.

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Letters to the Editor

(Continued from page 22)

time for papers and not much more for my correspondence.

The time in Mayaguez was very much worth while, but when I was asked to stay a second year, I declined. The Monterey peninsula is a lovely place and there are many retired Army officers here, some of whom are my own friends. But I do not feel choosy about the location of my next assignment. And I am not in a frenzy of hurry.

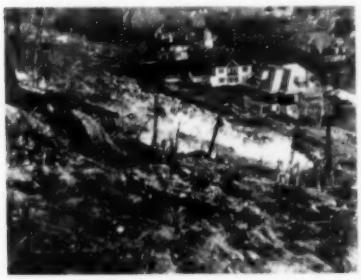
Still, if you happen to hear about anything I shall be glad to have a chance to know about it. So many thanks in advance and for the past.

Jack Hinman, Jr.,
(Temporary address)
2875-C Pacific Hghts.,
Fort Ord, Calif.

INDEX OF ADVERTISEMENTS

—Worth Seeing

Lettering on this D. W. Onan rolling power house leaves no doubt as to what it is. Contains four Onan electric plants and elaborate control panel for demonstration of any type of automatic generator operation. (Above and right.)



From a drawing of street intersection where vehicular traffic is controlled by radar. Signals are transmitted from an electronic "magic brain" which calculates traffic flow and fits signal changes to its demands. Designed and manufactured by Eastern Industries, Inc., Norwalk, Conn. →

This Atlas Powder-ed explosion is no H-bomb, but it does the job in close-quarters blasting for the great new New York State Thruway construction. Our operatives report not a dish or window broken in the very near-by homes. (Shown in photo at left).

When Idaho recently added 39 dump truck units to its road construction and maintenance fleet the 22 shown here were Gar Woods with 3 yard contractors bodies on Ford **F-600** chassis, including special spare tire housings and G-W direct lift hoists. 15 additional ones purchased, with direct lift hoists, are not in the picture.

WORTH TELLING

by Arthur K. Akers

★ O. H. King assumed presidency of McWane Cast Iron Pipe Company, Birmingham, on July 19th. He retains his vice presidency of Pacific States Cast Iron Pipe Co., Provo, Utah. A. T. McWane, long president of the McWane Company, remains active as chairman of the finance committee.

★ Dr. J. A. Montgomery becomes president of Lakeside Engineering Company, Chicago, water and sewerage equipment manufacturers, succeeding Robert O. Friend, retired.

★ Butler Mfg. Co. Steel Buildings Division appoints M. W. O'Kelley

Mr. O'Kelley

Mr. Norman

sales supervisor for the Birmingham, Ala., region; Gordon O. Norman, Kansas City region.

★ E. N. Zimmerman succeeds Milo E. Smith as advertising manager of Chicago Bridge and Iron Co. He was formerly Mr. Smith's assistant.

★ Marion Power Shovel Co. has acquired controlling interest in The Osgood Co., including General Excavator Co., all of Marion, Ohio.

★ Robert Fay O'Connell becomes sales engineer, The Permutit Co., St. Louis office.

★ United Concrete Pipe Corporation, Baldwin Park, Calif., has tripled its pipe making capacity.

★ When you are at A.P.W.A. Congress in Atlantic City, Kerrigan Iron Works invites you to their exhibit of Weldforged lighting standards, accessories, treads, gratings, etc. Booth B-4.

★ J. T. (Tom) Guthrie of Tennessee keeps spreading out—commercially, not physically! He becomes Kentucky-Tennessee representative for Hydraulic Development's "Hydro-Tite" with stocks in Nashville. He also represents Hersey Manufacturing Co., Simplex Valve and Meter Co., and National Water Main Cleaning Co.

Mr. Guthrie

Mr. Murphy

★ George "Mike" Murphy is now supervisor of sales for the new Heil Colectomatic refuse unit. He will serve as consultant on operational and construction questions relating to sales of these new units.

★ In July we reported Neal F. Harmon as new sales manager for General Electric's 2-way radio, in Syracuse. Now he moves to Dallas as southwestern regional sales manager. *Now* he can get home to Arkansas oftener!

★ W. S. Rockwell Co., Fairfield, Conn., names Heat Engineering Supply Co., Monrovia, Calif., southern California valve sales representatives.

★ Neptune Meter Co., New York, has opened a new sales district covering New York and New Jersey with Charles W. Krause as branch manager.

★ American Hot Dip Galvanizers Association is being galvanized with new life, too, in a two day conference to be held in Atlantic City Sept. 16-17.

★ Thrift is a wonderful virtue—especially in an ancestor.

—*Dickey Data*

LOADERS Saving City $27,000 Annually!

From news article in CONSTRUCTION EQUIPMENT.

Self-Loading TRUCKS PAY for Themselves on Street Cleaning Work.

Amarillo, Texas, "The addition of two Holmes-Owen truck loaders to the Street Cleaning force is saving taxpayers thousands of dollars a year and doing a good job keeping the city spic and span," says Clifford L. Davis, City Personnel Manager.

"These units were mounted on Ford F-600 dump trucks with special 9 yd. capacity bodies for disposing of dirt and other debris that collects on city streets. Two of these self-loading trucks have replaced a 15 man crew formerly using five 4 yd. dump trucks and they work only 8 or 9 hours a day to keep up with the sweeping machines on day and night shifts."

"Although one man can operate a truck and loader, each driver has a helper. The second man directs traffic around pick-up sites and handles final cleanup with broom and shovel. Even then we've cut labor requirements from 15 to 4 men, halved the number of trucks needed and eliminated many complaints about delayed pick-ups."

"There's no way to determine the exact savings in reduced equipment and maintained expense, but they are considerable. We can pinpoint the annual labor savings at $27,000, nearly 5 times the cost of a truck and loader combined," said Mr. Davis.

REDUCES Street Cleaning Crew from 15 to 4 Men and Trucks Needed From 5 to Only 2

HOLMES OWEN TRUCK LOADERS are substantially reducing the cost of many jobs by cutting down on the number of men and equipment needed for such work. Cities like Amarillo, Tex., Birmingham, Ala., Chicago, Ill., Kansas City, Mo., Philadelphia, Pa., Washington, D. C. and numerous others throughout the nation are today realizing Big SAVINGS on many operations which they are now handling at lower cost with Loader equipped trucks.

The use of truck LOADERS will speed-up LOADing and HAULing, thereby assuring faster, more efficient work. It saves time, labor and equipment by permitting the truck drivers to do light digging, grading, cleaning-up and loading without the need of additional manpower or the use of more costly equipment. A truck with such versatile one-man operation can easily do the work of several men, and as such, becomes a valuable asset in reducing today's high cost of operation.

The Holmes Owen LOADER is hydraulically operated, lifts ½ yard per bucket, loads the average truck in 4 minutes and can be installed on most 1½ to 2 ton trucks. See your dealer or write factory today for full information on this work saver.

Manufactured by

ERNEST HOLMES CO.

Chattanooga, Tenn.

WHAT'S YOUR PLANT DOING ABOUT *Stream Pollution?*

There's plenty that can be done to improve streams, restore recreational areas and multiply usable water sources. Sometimes it takes new or additional treatment works . . . but many, many cases can be solved or greatly improved with adequate effluent chlorination.

W&T offers the engineer and progressive sewage plant operator the tools to economically and effectively aid in the nation's pollution abatement program.

These tools consist of a full line of chlorinators, chemical feeding equipment and controls—over forty years of experience—and a field service staff to handle promptly all installation and equipment maintenance problems.

W&T Chlorinators, with manual, semi-automatic, automatic, or various types of rate and program control, are helpful in many other plant problems, too—such as grease removal, filter ponding prevention and septicity reduction, to mention just a few.

Why not start your community on the road to clean streams? Your W&T Representative will be glad to help, without obligation, of course.

WALLACE & TIERNAN

25 MAIN ST. BELLEVILLE 9. N. J.